Quinn

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Tuesday, AM
January 3, 1961

Release No. 61-1

SPACE TASK GROUP BECOMES SEPARATE NASA FIELD ELEMENT

Space Task Group, charged with carrying out Project Mercury and other NASA manned space flight programs, today officially became a separate NASA field element.

In announcing the organizational change, NASA Administrator T. Keith Glennan said the action was recognition of autonomy already essentially established by Space Task Group. Located at Langley Field, Virginia, Space Task Group had been reporting administratively to Goddard Space Flight Center at Greenbelt, Maryland.

Under the new organization, STG Director Robert R. Gilruth will work directly under Abe Silverstein, NASA director of Space Flight Programs, Washington, D. C.

STG is composed of more than 600 persons. No geographical move or significant staff expansion is planned for STG at this time.

STG was set up in October, 1958, with a specific directive to put into orbit and recover safely a manned satellite in order to investigate man's capabilities in space -- Project Mercury. Last year, STG was assigned management responsibility for studies of Project Apollo -- a design concept which contemplates carrying three men on Earth orbital and, eventually, circumlunar missions.

STG will continue to use supporting facilities and personnel from other NASA centers, Department of Defense and industry as needed to accomplish its missions.

In directing STG, Gilruth is assisted by Walter C. Williams, associate director for Operations, and Charles J. Donlan, associate director for Research and Development. STG's three divisions are headed by Charles W. Mathews, Operations; Maxime A. Faget, Flight Systems; and James A. Chamberlin, Engineering.

- end -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Space Task Group Headquarters
Langley Field, Virginia

NEWS BRIEFING
PROJECT MERCURY PROGRESS REPORT

10:00 a.m., 11 January 1961

PRESENT:

T. KEITH GLENNAN, Administrator, National Aeronautics and Space Administration.

JOHN A. POWERS, Public Affairs Officer, National Aeronautics and Space Administration.

ROBERT R. GILRUTH, Director, Space Task Group.

CHARLES J. DONLAN, Associate Director, Space Task Group.

WALTER C. WILLIAMS, Associate Director, Space Task Group.

DR. ROBERT B. VOAS.

MR. POWERS: May I have your attention, please.

Ladies and gentlemen: I would like to welcome you to the Langley Research Center and the NASA Space Task Group. We are very happy to have you here today with us. We haven't had a session like this, or an opportunity to have all of you here together, for quite some time. We wish we could do it more often; but in the face of the pace of activities involved in trying to get the Mercury mission done we haven't been able to cover all of the fronts we might like to cover.

What we would like to do today is to give you a project report on Project Mercury. I think that each of you has been provided with an agenda, or timetable -- call it what you will. In addition to giving you a progress report we hope that perhaps we can bring your education level with regard to manned space flight up to a better position, a better status, so that as we get down to the time where we will actually be flying man, you will know more about what is happening, how it is happening, why it is happening, and what some of the results of these tests might be.

You will note that the agenda is essentially broken down into two stages. We expect to have a presentation here this morning by our senior management officials, winding up with a program on Astronaut Training.

This afternoon we will have displays set up in a nearby hangar and we intend to take you through our primary training center to observe the astronaut in the trainer, working with the people he has been working with for several months. We have already sent the photographers, newsreel teams, and some of the television people out on the tour to see some of the same things that you are going to see this afternoon.

We will not have pre-printed copies of the presentations that will be made today. We are making a record. We will have a transcript available within two or three days. If you so wish, we can provide you with one. We recommend that in the process that you take some notes here today.

Later this afternoon we will have a question and answer period; and later this afternoon we will have a couple of items of business having to do with news media coverage of our program that we would like to discuss with you, and give you an indication of what some of our plans are and to try to work them out with you.

If you haven't already noted, we have a rather comprehensive collection of photographs laid out on your right. In addition, there are several items of background information that we have prepared for your use and consumption. I think that I would like to invite your particular attention to a paper that we have labeled, "If" -- the simple word "If". In that paper we have tried to outline as many of the things that we think could possible happen in a Mercury mission and explain to you what alternate opportunities, resources, one thing and another, are available "If" different things happen. It is an interesting piece of paper. I recommend that you take it home and do your homework with it.

Are there any questions on the agenda or proceedings? If not, without further ado I take great pleasure in introducing the gentleman who has been at the helm of NASA since it was born -- Dr. T. Keith Glennan.

REMARKS OF DR. T. KEITH GLENNAN

MR. GLENNAN: Ladies and gentlemen: I hope your time spent here today will be profitable and useful to you as well as to the people of the Nation.

It is apparent, as you look at that schedule, that Bob Gilruth and his team have laid out a pretty complete progress report program for you here today. Before that is undertaken, however, I would like to say just a few words, I suppose somewhat in the nature of a valedictory since my time is short.

I think it is accurate to say that NASA has come a very long way since 1958, in October, when we declared ourselves to be in business, and I think that as you go through the day's activities, Project Mercury is a very good example of the kind of progress that has been made.

Mercury is just one of many projects which we have under way and on which this kind of progress has been demonstrated. I think that even among the members of the press there is probably general agreement that the United States has established meaningful milestones in space research in these last couple of years.

The other day a reporter asked me what successes had given me the greatest satisfaction in my two years or more here at NASA -- actually it will be about 29 months when I leave. My answer was that I felt that which had given me the greatest satisfaction was the knowledge that we had been able to put together an organization of very good people, maturing today into a hard-hitting organization, with quite definite guidelines as to their activities in the future, and that we had been able to put together a program which is broadly based, from which I think my successor and what will then be his organization, can move with considerable assurance in almost any direction they may choose.

The fact that we have successfully completed slightly more than half of the experiments we have undertaken is another and specific satisfaction to me. There have been some interesting and satisfying individual results. If one could look at Echo -- which you know was developed here at Langley with the assistance of other elements of our organization and the laboratories, those most prominently concerned being the Goddard Space Flight Center and J.P.L. within NASA.

Or you could talk about TIROS, which seems well on its way to launching a really useful satellite program as we move next year into the first flights of NIMBUS, which we hope to have as a prototype, if you will, of what may be the meteorological satellite system of the future.

Or to Pioneer V, which I think has not really been appraised as it might have been. It was a spectacular achievement, I think, to be able to talk to a little thing like that 22,500,000 miles away. But the significance of Pioneer V was that we gained assurance that we could send satellites into deep space and get information back from those satellites. The laws of celestial mechanics are such that one can determine after a few hours of flight where a particular body may be going. But I don't see that there is very much gain in just sending a package to, or toward, Mars, knowing that because of the laws of celestial mechanics ultimately it is going to get into some particular orbit around the sun, if you really can't get back something useful from it.

Pioneer V was one of those experiments which gives you assurance that with the larger payloads we will have available to us in the reasonably near future we can do the kinds of things that we want in deeper space.

Satisfaction, the kind that comes from progress in research and development programs such as NASA's, is derived from many things, and many of them are not very spectacular. Some of them are spectacular in the sense that they are characterized as failures, but you are sophisticated enough to know that this is a research and development program; it is not a composite of individual shots, each of which must stand on its own, but that rather from all of these efforts we gain information which makes more assured the success of activities which we will undertake in the future.

This is indeed the case with a project such as Mercury, which is, I think, one of the best organized projects we have. I would pay particular tribute right here to Bob Gilruth and to Walt Williams and the other good people who have carried the load on this program night and day for these past two-plus years.

I don't need to remind you that our activities are aimed at developing knowledge of outer space and applications useful in the space environment for beneficial purposes, non-military purposes, if you will, although from our programs certainly much very useful information is derived which goes to the military and will assist in their programs; and the reverse is also true.

Coming down on the aircraft this morning John Finney raised a question with me about our relationship with the Defense Department and Mercury in the process of joining up a new set of controversies with the Air Force or other elements of the Defense Department. As honestly as I can say it, I think this is a misconception on the part of whomever writes that sort of thing. We are people, both ourselves and the Defense Department, ambitious, imaginative people. And there will always be, in two organizations, a certain amount of pulling and hauling. But I believe that we have, in the past year, had less in the way of real controversy and more in the way or really solid cooperation than anybody, including myself, had any right to expect.

We had set up, as you know, in the middle of last year, an activity known as the Astronautics and Aeronautics Coordinating Board, a title that was sort of wished on us. I am delighted at the actions that have been taken within that Board. It is not a voting society. It is a debating society, decision-making powers residing in the people who are involved. It is a substitute, if you will, an effective substitute for what was in the law as the Civilian Military Liaison Committee, which was just what its name implies, a pipeline between two organizations where, indeed, we must have pipelines at all levels, where we must have complete integration of our thinking and planning so that we do indeed avoid duplication and controversy.

The AACB membership is made up of top-levelmanagement people in both organizations, chaired, as you know, by Dr. York and Dr. Dryden. Dr. Dryden has complete authority to make what decisions he wants to make that he thinks are in the best interests of NASA in those meetings, and then he comes back home and puts his decisions into action. And the same thing is happening on the other side of the Potomac.

The panels themselves are headed by the responsible management people in each of the areas involved. And while a substantial amount of the activity of the Board is, as one might expect, not publicly available -- and should not be because it is a matter of management decisions that need to be made -- the results are available and the actions that are taken.

Finally I would like to address myself to an area that directly concerns you in the news media. For some time we have been disturbed about the lack of real understanding by the man in the street about the nature of this program. I have had the privilege of visiting together for three days last fall with some of the science-writing fraternity and some of the editors of our great newspapers and scientists, in an out-of-the-way place, but a very pleasant place, in northern Minnesota, to discuss this matter of how does one really operate with responsibility on both sides of this interface of the management of a program of this sort and disseminate news about a program of this sort.

We thought about going into the activities of our space business and the space business since that meeting. We are all worried about creating another Vanguard situation where one builds up a circus atmosphere and then finds the difficulties which normally attend the conduct of any research and development program that vie us a great deal of problems, loss of "prestige" or whatever you want to call it.

I talked with friends in the newspaper business and with our own staff. We finally decided we would try a change in our method of dealing with these problems. As you know, we have up to now, about a week before any launch, held a logistics briefing and distributed press kits which were embargoed until lanuch. I guess it is in complete consonance with what the Defense Department does with their activities as well on the East Coast.

We are going to try to provide you with more interpretive material sometime ahead of any particular flight, many times having nothing to do with a particular up-coming flight but to do with the total series of which that flight might be a part. This is being done not in an attempt to manage the news, but rather to give you as accurate a picture as we can of what we are trying to do where it fits in the total program; if it is a flight which is one of a series of flights in a particular program, where it fits into that series; perhaps something of the difficulties that are to be encountered in this particular series, and what we would expect to get from it.

We propose to provide this on a basis which will embargo it for a couple of day, wholly for the purpose of getting this same sort of material distributed around the country. It will be released for pre-launch use, rather than launch, or post-launch, use. We hope to be responsible in what we hand to you.

The continuation of an effort of this kind will depend largely on how responsible you are in handling the information. If there is consistent breaking of the embargo, we will simply have to go back to other ways of handling it. I would rather believe that we can operate in a partnership venture with good will on both sides, our people attempting to be more helpful to you than they have been in the past in the matter of this interpretive type of material, and you, on the other hand, being as responsible as you can be in putting it out for public consumption.

I do want to stress, as I have in my public utterances in the last six months, the fact that this is a research and development program. It is made up of a series of individual experiments, many of which must fail. It is the nature of research and development. I doubt that very many of us pay enough attention to that because we, too, become enamored of the individual shot on which we are placing all of our "beans" at the particular time. But I have high hopes that by this changed policy we can achieve better understanding the country over.

With respect to Mercury, particularly, it is a matter of the highest public interest. We know that. It ought to be conducted in something other than a circus atmosphere, however; it is a serious business that we are involved in. And while I know that it is difficult sometimes to separate these various aspects of a program of this kind, I would hope that we can avoid flying a man in a circus atmosphere. There is just too much at stake for that kind of a build-up which ultimately may lead to a serious let-down.

As I say, we propose to go through with this new policy, developing the various aspects of it as we go along. We would be glad indeed to have your reactions to what we are doing, to the character of the material that we are giving you, its completeness. Any criticisms that you want to make about what seems to you to be an attempt to manage the news. This we do not want to be given. If the policy doesn't work, then it will have to be examined.

I am glad to have had this chance to just visit with you briefly. I think we had better get on with the rest of the program. You have a very full day ahead of you.

Thank you very much.

MR. POWERS: I would like to introduce now Mr. Robert R. Gilruth. To most of you he does not need introduction. He is the Director of the NASA Space Task Group and also the Director of Project Mercury.

REMARKS BY ROBERT R. GILRUTH, DIRECTOR, STG

MR. GILRUTH: Ladies and gentlemen, I am going to talk a little bit about the management aspects of this project, and I will be followed by Mr. Donlan and Mr. Williams, who will pick up the more technical aspects.

In October of 1958 the Mercury vehicle was only a concept. In two years this concept has been translated into facilities, trained teams, and flight hardware, and it is now in two-plus years in the initial phases of production flight tests.

This was an unusual and complex task. It required an integration of missile technology with the manned flight requirements. It involved an unprecedented cooperative effort between the military and civilian, and with foreign countries.

It involved the building of a new technical know-how, that is, manned vehicle design and flight test methods, aeronautical unknowns, worldwide tracking and communications, and the development of industrial production and operational capability.

The Space Task Group, which is doing this management job, has been built over the past few years to its present strength of about 600 persons, of which about half are technical specialists and the other half are in support types. Some idea of the functional relationships in this management task is illustrated in this slide.

(Slide.)

The center area is the Space Task Group and under the Director's office are shown the various technical divisions: engineering, flight systems, flight science, operations, and launch. The reporting path to Washington is shown here. The Aero-Medical Advisory Group under Dr. Lovelace is shown here. And the support channel to Washington is shown here.

In these various blocks are shown the major elements requiring coordination in this project. Here is the Research and Development phase, the Production phase, Recovery operations, Launch operations, Network operations.

We have shown only the principal elements here, such as the various NASA Research Centers, here in the Research and Development block. Air Force appears only as one block, although I might point out that this includes various elements of the Air Force, such as the Arnold Engineering Center at Tullahoma, the School of Aviation Medicine, the Holloman group which is doing the animal training for us, the Ballistic Missile Division, and so on.

The Navy is principally our recovery arm for retrieval of the capsule. They also have cooperated in the use of the Johnsville centrifuge and in many other ways.

The Army supplied us with their only flight surgeon, and is also involved in the White Sands Proving Ground and in the amphibious vehicles for the recovery operations.

The production side of course is McDonnell Aircraft Corporation with all its various subcontractors.

And while I have not shown it, there is a missile production which is managed through joint cooperation with the Air Force in the case of the Atlas, and the Marshall Center in the case of the Redstone.

I won't go through this in detail. As you can see, it is a complex which requires considerable coordination to make all of these operations and hardware and plans come out into an integrated activity.

The Mercury vehicle, while it is a frontier-type of effort, embodies many fundamental features which will carry on in future space investigations. For example, the escape capability which is built into Mercury will find its counterpart in many future space vehicle in the foreseeable future so long as we are dealing with large, complex, liquid rockets in the launch phase. The experience here has direct application to future projects.

The world-wide network and the real time computing for the display of orbit and trajectory data during the launch is a fundamental part of Mercury and is an essential part of any future manned space flight.

The medical and life support base which is being created in Project Mercury has direct application to future projects. The initial solutions for the in-flight control problems and the retro and reentry maneuvers are another.

Similarly the know-how and experience being accumulated in the recovery operations has direct application. While Project Mercury is a Wright Brothers phase of manned space flight, it does have a direct and useful bearing in the future of this kind of activity. The results from these flight tests, along with the management, technical, and industrial teams created, will provide a strong base for future manned space programs.

Thank you.

MR. POWERS: I would like to introduce our Associate Director of Project Mercury, Mr. Charles Donlan. Mr. Donlan is our Associate Director for Development and will talk about our R and D program.

REMARKS OF CHARLES J. DONLAN, ASSOCIATE DIRECTOR FOR DEVELOPMENT, SPACE TASK GROUP.

MR. DONLAN: I would like to talk with you about the R and D program of Project Mercury. This program started back in October of 1958 and was preceded perhaps by a 12 or 18-month period of similar activity at the Langley Laboratory. In order to get a feel for how this whole program was integrated I thought we would go back to this time and tell you how the program originated and how it is that the various R and D programs that we find ourselves in are developed.

There are two basic frontiers in establishing any sound R and D program. The first is that the objectives always have to be kept in mind.

Secondly, any guide lines or restrictions which you find imposed on this program must always be realized.

(Showing slide.)

This slide was prepared about two years ago. It represents the objectives, basic principles, and the method as conceived for implementing Project Mercury. It is of some interest that these objectives, principles, and methods have stood up under our own self-analysis and in the project.

The first objective is the orbital flight and recovery, the one that is in the limelight. This is the dynamic active phase of the program, the one the public is most conscious of.

The second, man's capabilities in space environment, is by far the more far-reaching in its effects. As Mr. Gilruth pointed out, the results of this program which will demonstrate man's capabilities in space will have far-reaching effects on future projects.

This is an area which is overlooked at times by members of the scientific fraternity also. Later on Dr. Voas, and following him, Commander Shepard, one of the Astronauts, will speak a little on this subject.

The basic principles, which were outlined a couple of years ago, the simplest and most reliable approach; second, minimum of new developments; and third, progressive build-up of tests, still constitute the framework for Project Mercury. As to the method:

1. The drag vehicle, which could be attacked in the simplest manner;

2. Use of an ICBM booster;

3. Use of retrorockets for bringing the capsule back from orbit;

4. Use of the parachute descent; and,

5. Provision of an escape system, are indeed the way the program has developed.

(Showing slide.)

This slide depicts the normal intended orbit flight for Mercury. The capsule is launched with a booster, goes into orbit, and is eventually returned and descends by means of a parachute to the water. The reason I want to show this slide is because of the necessity of considering these so-called abort phases. With a man in the system it is necessary to provide an escape mechanism, and it is necessary to provide a means for getting the man off the pad in case of booster malfunction; it is necessary to provide the means of getting him away from the booster in its initial phases of flight while it is still thrusting; and it is necessary at the last minute, if one finds that the speed of flight is such that an orbit is not in the cards, to be able to bring the man back. This is the latter abort after staging indicated here.

It turns out that many of the problems that such a requirement imposes on the program are as difficult if not more difficult than the provision for meeting the fundamental objectives of the program. It is by inspecting each range of such a program that one can conceive and develop a program that has to be undertaken to be sure of its implementation.

For instance, on the next slide we have shown here six different configurations which came out of a study of a slide such as the previous one.

(Showing slide.)

We find that the capsule, with the tower on it, for instance, has to be statically and dynamically stable in that configuration. It also must move without the tower on in the exit phase and the abort phase in this manner and must re-enter with 180 degrees reverse movement. It is rather ironic and people are sometimes surprised to find that a program like Mercury, with a space capsule, designed fundamentally to fly in a vacuum, has posed more aerodynamic problems through a speed range that has been unprecedented in the last ten years in aerodynamic research. For this reason we have a tremendous wind tunnel program to see if indeed the shape of such a capsule to meet these conflicting requirements could be designed.

In addition to that, the capsule had to work on different boosters, and the combination of the capsule and booster shape, each had to be investigated in its own right.

As a result of this a very comprehensive program was undertaken resulting in something like 5,000 or more hours of testing over 70 different configurations in one hundred-odd tests. And to give you a feel for the wide use of the national facilities that we used in this program, I will show you the next slide.

(Showing slide.)

This represents the various facilities that we used in this program. Much of the work was done here at the Langley Research Center where facilities are available for from zero flight up to Mach 10 or more. The Ames Research Center has a special device which gave us information on the dynamic stability and load areas up to Mach 14. The Lewis Research Center, and McDonnell Aircraft Corporation which has the primary contract here, also has a wind tunnel facility and many of the tests fell there.

The Arnold Engineering Development Center had a part of it, and the Army Ballistic Missile Agency was also involved in the case of the capsule booster -- the Redstone. This of course represents a very close coordinated effort between the Space Task Group and the prime contractor in ferreting out these problems and determining indeed what specific tests were needed. This is only one phase of the work, though.

(Showing slide.)

The wind tunnel program was instrumental, for instance, in determining the shape, along with the stability. The rest of these items -- structure, heat shield, parachutes, attitude control system, retrorockets, escape system itself, sequencing system, couch, impact structure, environmental control system, and instrumentation, all represent areas where very extensive R and D programs were carried out. It is impossible in the time available here to do much more than try to give you a feel for the depth of this activity. We have summarized on the next slide some of the areas where we tried to solve the problems mentioned.

(Slide.)

For instance, in addition to ground facilities we have the flight programs. The reason for this is that in-flight conditions cannot be duplicated on the ground facilities. The range of speeds are too great, the conditions of the atmosphere, the heating, cannot all be duplicated. The sequencing of the various things that have to take place in, say, the parachute recovery system, can only be done by repeated and demonstrated programs of tests. This is what these vehicles up here were designed to do.

The pad abort, a full-scale capsule pulled off the beach with an escape rocket, simulated the type of escape that will be needed in the event a pad abort occurs.

The Little Joe program you are quite familiar with, was carried on for the program by the Langley Research Center and was an extremely successful and helpful program in demonstrating the essential features of the whole approach and in working out the details and the sequencing system and so forth. We have shot something like five of these Little Joes. We have one left which we hope to get off early this year.

The Big Joe program, which was launched in September 1959, was aimed basically at solving the heat problem. While much had been done in the technology of ballistic missiles, the particular re-entry trajectory which the Mercury capsule must use is not the same as the re-entry trajectory for ballistic missiles. It is flatter, and the time of the heat area is two and a half or three times as great, and no one had really put this to a test. That was the reason for having to lay on a program like Big Joe which would duplicate the kind of trajectory we needed to see if indeed some of the later type materials we used could do the job for us.

There are a number of miscellaneous programs here: recovery system and hydrodynamic tests, for example. This capsule has to not only re-enter but must be a seaworthy vehicle for the duration of time that the pilot is in there before pick-up. Also the rocket model tests I have discussed.

The Drogue-chute tests, this is a particular type of program which was precipitated in the middle of the development. We found, after extensive work with the parachutes, that every now and then we would get one that didn't quite function the way it should. This required really an inspection to see that we indeed subjected the parachutes to the right loads and in the right conditions in order to see if they would work. For this reason the Edwards Flight Research Center took on the task of determining what type of a program could be made to give us information on this. They came up with an F-104 program in which the parachute was deployed from a package after its release from the aircraft. This was very helpful in determining the characteristics of the drogue-chute to be used.

Shingle tests, posigrade rocket tests, and escape rocket tests are really only some of many that have been outlined for this program. We have utilized the services of a great many companies and service groups in this country to help us do this program.

There was one other area that I would like to mention.

(Slide.)

While the material I have been talking about appears to be conceptual in nature and to check out our ideas, remember that many of our R and D programs were done in what we call boiler plate capsules. In other words, one element at a time was investigated in order to assure that the test would be successful for that, or had a good chance of success. To investigate that, other factors were purposely made stronger or stiffer, or some liberty taken with them. But when you come to the Mercury capsule itself -- and this is a task which the McDonnell Company has, for meeting the requirements of weight, lightness and strength -- you find yourself faced with a need for demonstrating positively that the capsule will indeed carry the man, and even survive the rigors of trajectory.

In this trajectory sketch we have listed some of the factors that have to be taken into account in the design of the structure. For example, acoustic noise. This capsule finds itself in the launch area with tremendously high levels of noise, aerodynamic noise mainly, generated from the swishing of the air over the capsule. How does the structure stand up under this, and how does the instrumentation behave? This type of thing can only be done by subjecting the capsule to the kind of environment which it is expected to be subjected to.

In the abort maneuver, this twisting and turning in a high dynamic area at fairly low altitude, maybe 20,000 feet, and very fast, the structure has to be able to withstand this if indeed the recovery system has even a chance to work. And so on.

You will find here that as the McDonnell people have looked into various and sundry phases of this program they came face to face with such questions as what happens if the capsule is in this position, and the parachute doesn't open, with the canister on top. Things like this require a tremendous amount of introspection and work.

I have talked mainly about the capsule. We are using in this program ICBM boosters and the Redstone boosters. But these have never been man-qualified. With man on them, there are systems we call the automatic abort sequencing system which had to be developed. These were R and D programs in their own right.

These are the kinds of things we are checking out one by one, a step at a time, with the programs at Canaveral using these boosters. In addition, I haven't mentioned any of the R and D programs that were required to determine training requirements; for example, procedures training, things like that. Mr. Williams will tell you more about some of the complexities of the operation phase of this.

I would like to show one more slide.

(Slide.)

This typifies the Redstone type flight. We have completed one of them very successfully. We have several more coming up. We are entering into a phase now where we match the hardware, the capsule hardware, the real honest to goodness sheet metal that composes the hardware, of all the systems to the boosters. We are doing this for the first time.

There are several flights that have to be accomplished in order to assure us that the kind of thing that we saw on the last slide, where the structure went into various and sundry maneuvers, has enough integrity to allow a pilot to fly it.

Thank you.

MR. POWERS: I would like to introduce Walter C. Williams, Associate Director of the Space Task Group, Project Mercury, for NASA.

Mr. Williams.

REMARKS OF WALTER C. WILLIAMS, ASSOCIATE DIRECTOR, SPACE TASK GROUP.

MR. WILLIAMS: From the operational end of this thing, our problem, of course, is to take all these bits and pieces -- capsules, boosters, ranges, the Navy -- and put them all into an operating team. This can be summed up as people, procedures, and facilities.

People, of course, have to be trained. I will limit my remarks to those concerning people on the ground.

We, of course, have had the problem of making astronauts out of aviators, but we have other people who will talk about this.

We have had the problem of taking people who were essentially airplane people and indoctrinating them into missile procedures. At the same time we have had missile people with the boosters who now find themselves faced with the problems of now carrying men on their devices.

In addition, there was the matter of training Navy crews for picking up the capsules at sea and so on.

In the procedural areas the procedure for the firing of missiles was well established. However, they did not include the procedures whereby you brought a man into the picture. The easiest way out would be to put a man aboard early in the count and get him out of the way. However, this is not a reasonable operation since we want to put the man in at the very latest possible time in the count, which meant that you had to integrate directly with what you had to do with the capsule-booster combination.

Facility-wise, I think some of the facilities are quite obvious and have been described or mentioned. But more subtle changes had to be made as well. Cape Canaveral is an excellent test facility for both winged and ballistic missiles. However, some structures do not lend themselves readily to manned operations and some modifications had to be made and certain procedures had to be modified in containing whatever damage might be done. We had to go in and get the man.

The matter of recovery in local areas with a man aboard proximates those of your crash crew on an airdrome. So we had to look for vehicles that could move under these circumstances, and also that could move through the tangles, brambles, and whatever else may be on the Cape.

This is generally the type of problem we have had to face up to. I think it might be interesting to look in detail at the things we have had to do.

We have tried to use whatever capabilities existed, and I will try to point these out as I go along, wherever they existed in the national picture, to take advantage of the experiences. And there is also an international aspect, as mentioned earlier. So we have a conglomerate mixture of civilians, government civilians, contractor personnel, military personnel, military-employed civilians, and foreign people involved.

But let's say that we are going to go through one of our operations, and let's look at what we have to do and what some of the detailed phases are as well.

(Slide.)

This gives an idea of the things that we have to do. Under our mission planning and requirements we have launch operations, to get the capsule ready, on the pad and get it off. Flight operations involve in-flight control, both from the standpoint of the booster, where we have to make a decision whether to continue the flight or not, and next is the recovery operations.

Here we have facilities to check out, we need a central control station center at the Cape where information is presented in real time, with real time decisions to be made as to the status, and the network.

Then we have the procedures and training with astronauts, station operators, and flight controllers, and general manning of facilities from the standpoint of mechanics, technicians, inspectors, and so on. Under implementation of operations facilities we have vehicle checkout, central control, remote stations, and worldwide network.

Here are the things we go through in capsule preparation. As it is delivered to us by McDonnell, it is given a good look over. We then take experiences of previous flights, previous checks with capsules, and make certain changes as required before we go into the testing that is required of this particular capsule for flight.

I think you will all recall our difficulties with Little Joe. We have had to incorporate the lessons of that experience into the capsule.

Then we have a systems checkout, checking the various systems, the reaction control system, stablization system, environmental system, recovery system, and so on. Then we go through an electronically assimulated flight test where we assure the function of the capsule sequence systems.

Next is to take the capsule and mate it with its booster. We do this on the pad. Here we have the problems of checking compatibility of the two. These, of course in many cases, are a one-time-only problem. The first time we have mated a capsule, this should handle the major problem. But there will be small ones along the way, where radiation patterns differ somewhat and so on. We are required to do this with each booster-capsule combination. Also, capsules, as our programs progress, have more and more systems in them that will have to be checked for compatibility with the Atlas.

Then we go through the so-called flight acceptance test, where both the booster and the capsule run through a simulated mission together.

Then we have at this stage the static firing of the booster with the capsule in place and all capsule systems working.

Next we have the launch preparation, which includes the installation of live pyrotechnics in the capsule, loading systems, oxygen systems, putting in the flight parachutes, and so on.

Then on the pad again is the launch of the capsule. The control of the operation at this stage of the game is from the blockhouse, which monitors both the booster and the capsule systems.

Here we monitor the flight. This is quite a facility. During the launch we monitor the flight path of the booster-capsule combination to determine that we are going into a proper orbit and have the choice, of course, of initiating an abort at any time that we are not. Also, we are monitoring all the capsule systems during this period, as well as the astronaut himself. As most of you know, the astronaut will be wired for sound, so to speak. We will be measuring a number of physiological characteristics of the man. We are in the position from the control center to know what is going on at all times.

During the orbital phase, once we put him into orbit we will receive information back from the down-range stations, and worldwide stations, that will keep us informed.

Reentry can be commanded from here as well as a number of the other range stations around the world. This is the one nerve center of the total operations. It is also from here that we would alert the recovery forces, either in primary areas or others.

It might be well now to look at the world a bit, where our stations are located.

(Slide.)

I think the network itself gives an indication of the numbers of people and the part that the stations will play. Up to now we have used McDonnell as the capsule contractor, and BMD as the booster contractor. The Atlantic missile range maintains a control center for us -- that is, the back room equipment; telemetry and so on -- that is required to make the displays work in the center. I will get into that later.

We have some sixteen stations listed here. In addition to Cape Canaveral, the control center there, we have a rather elaborate station in Bermuda, which is a secondary control center. In the event we lose track or communications from the Cape to the capsule, Bermuda can take over and carry on as we would in the Cape.

The next station on that net is a ship, telemetry only, stationed in mid-Atlantic. The Bermuda station is operated by a NASA contractor.

The Canary Islands is the next station. It is operated by NASA.

The next station is in Kano, Nigeria, which is operated under contract with NASA.

The next is Zanzibar. Zanzibar and Kano are telemetry and communications only, but with no tracking. We would track at the Canary Islands.

The next station is a ship again, in the Indian Ocean.

Then we have two stations in Australia. These stations will be operated for us by the Australians.

The next station is Canton Island, in mid-Pacific, which will be operated for us by the Pacific Missile Range. The main station is basically a Pacific Missile Range station to which we have added equipment and thereby operated by PMR.

Along the West Coast we have two stations, one in Mexico, a NASA station operated by NASA, and the importance of this station is that it is a command station and will allow us, if necessary, to command reentry on the first pass, the station from which we would accomplish this type of operation.

There is also a station at Guatemala, which again is basically a Pacific Missile Range station, as we will use it.

We then have a station in Corpus Christi, Texas, and we are taking advantage of the equipment that we have at Eglin Air Force Base.

In addition to some of the telemetry equipment on some existing Atlantic Missile Range stations, we have augmented the telemetry equipment in some of the Atlantic Missile Range stations to assure ourselves of telemetry data during reentry.

Let's look at the type of recovery situations we have to face during this operation. From our normal launch base we will be going, as is obvious from the network, over the North Atlantic. I have a map on the next slide which will show this in detail, but these cover our abort cases which we feel may occur because of the very nature of the thing we are dealing with.

In addition, we have a planned recovery area in the Atlantic on each orbit and here we are using ships and aircraft. On our shorter shots, helicopters and airplanes are used as well for recovery. On the launch site, where we have to operate on land in the Cape area, or in shallow water and mudflats, as well as in the surf, we are using some of the Army's amphibious vehicles. This is also the crash crew type of thing.

In the contingency areas, which are really anything but the North Atlantic and the local area of the Cape, we will mount a very limited effort. We feel the probability of a contingency recovery is extremely low in that all of our flight systems and the capsule configuration is so designed that our best bet in most cases would be to continue the particular orbit that the capsule was in at the time and bring it back into a planned recovery area.

We will deploy some air-sea rescue units on a worldwide basis. This deployment will amount to something very similar to the deployment SAR does in the cases of world trips by, let's say, the President or any trip of very important people around the world.

That outlines our recovery areas. I think if we look at a map we will see how the forces are deployed.

(Slide.)

Our recovery problems have been delegated to the Commander in Chief, Atlantic Fleet, who in turn has delegated the command of the task force to the Commander, Destroyer Flotilla Four, for recovery.

We have listed here some nine recovery areas. Areas 1 through 6 essentially cover the abort cases, and the ships are indicated by the squares. We cover the Atlantic fairly well from Cape Canaveral to the African Coast. Areas 7, 8, and 9 are our recovery areas at the end of each orbit; 7 at the end of one, 8 at the end of two, and 9, which is our plan, at the end of three orbits. It is down range from Cape Canaveral and there will be ships and aircraft in the area. That is where we expect to pick up our astronaut when we do have a successful three-orbit mission.

Thank you.

MR. POWERS: One of the things that you are going to see this afternoon is the MR-1 Mercury spacecraft. It is a Mercury spacecraft that has actually flown, that has actually been in space. We were fortunate enough to have had a successful launch on the 19th of December.

I would like to show now about three or four minutes of film that shows the successful launch itself and gives you a little look at the recovery operation and shows the spacecraft back on dry land with a very recognizable face, looking in the door after the flight.

(A film was shown.)

MR. POWERS: We are ahead of schedule. I would like to suggest that maybe we can take a ten-minute break.

(A short recess was taken.)

MR. POWERS: There have been a number of questions raised during the past hour and a half about a thing called Apollo. I think the only comment that we can make at this particular time is that Apollo as a program exists in the form of feasibility studies. We have three companies conducting feasibility studies on the program: the Martin Company, Convair Division of General Dynamics, and the General Electric Company.

I think it is also important to point out that in the discussions that you heard from Mr. Gilruth, Mr. Donlan and Mr. Williams, if it was not apparent it should be that one of the things that is evolving from this Space Task Group and from Project Mercury is a management base upon which you can build future programs.

The technology that we are acquiring in Mercury has a natural feed into follow-up programs. Some of the very same people in our organization who are working on Mercury are automatically feeding their knowledge, their experience, their test results into Apollo.

Now to get on with the program we have Dr. Robert B. Voas. Dr. Voas is a psychologist on our staff and has been one of the prime architects of the Mercury Astronaut Training Program.

Dr. Voas.

REMARKS OF DR. ROBERT B. VOAS, PSYCHOLOGIST.

MR. VOAS: Ladies and gentlemen: This morning I would like to discuss very briefly with you five points regarding the role of the Astronaut in the Mercury program and the Mercury flights. First of all I would like to talk a little bit about what the Astronaut adds to the Mercury vehicle. As you know, the Mercury vehicle has automatic systems which allow it to carry out the pre-programmed flight without the aid of a pilot onboard. However, once the pilot is inserted he adds to the capability of the system in two very significant and important ways. First of all, he adds to the reliability with which the basic mission can be accomplished by offering alternate ways of achieving the flight should any of the automatic equipment malfunction.

Let me give only one of many, many examples. There are many examples because the Astronaut is able to take over on any of the major functions of the equipment throughout the flight program. One example of this might be the initiation of retrofire. Without the Astronaut aboard retrofire can be initiated through the clock which will automatically send out a signal at a pre-programmed time, or from the ground through a command signal. With the man aboard these two ways are of course still available. However, the man can fire at a signal, a voice signal from the ground; he can set the clock himself or change the setting at a voice command from the ground; he can observe through the periscope his position over the earth and calculate when to fire the retrorockets; or even without being able to view the earth but given a functioning clock and his maps, he would be able to initiate a retrofire at approximately the correct moment.

Therefore, when the man gets aboard we still have all of the automatic systems available, working, but we have added a number of alternate systems for accomplishing the task.

This is true not only in initiating retrofire, but is true throughout the mission. Many, many examples of this can be given for nearly every activity through the mission of the man usually providing not just one but two or three extra channels to produce a given operation.

A second important function of the man is to give the system flexibility. Through the automatic programming the vehicle is put into one attitude and follows a pre-program sequence of events. It cannot vary in any marked way from this pre-programmed series of events without the man aboard. However, with the man aboard the vehicle can be put through any of a series of maneuvers: it can fly upside down, it can bank, pitch, and roll, in order, for example, to get views of different areas of the ground, different stars in the sky, the moon, the sun, whatever is of interest.

These unprogrammed maneuvers, this flight flexibility, cannot be achieved without the man aboard who can take over and carry out these programs.

Therefore, the man adds these two important factors to this automatic vehicle when he is aboard: reliability, increased reliability, and flexibility.

Now let's get down to specifics. Specifically what are the activities or task of the Astronaut during the flight. I think in general these are underestimated. Because the vehicle is automatic it is often felt that the man will be passive, that the passenger will do nothing. This is not at all correct. First of all we have already spoken of his role in increasing the reliability. If he is to do this he must carefully monitor all of the systems onboard the vehicle and see that they are operating properly, and be in a position to take over should any of them malfunction.

Secondly, we have talked about the flexibility which he adds to the mission. If he is to do this he must take over the attitude control of the vehicle, bring the vehicle into an attitude which he wants for making observations, or any other purposes. So he cannot be passive, he cannot sit back and enjoy the ride, if he is to perform the mission which is intended for him in the Mercury flights.

Specifically his activities are as follows: First of all, he monitors carefully the sequence of events, such as separating from the booster, jettisoning the tower, firing the retrorockets and so on, that sequence of events which you saw earlier in the MR-1A flight pictures. He monitors these carefully, making sure that they happen properly and at the correct time. If they do not, then he takes over and through his own mechanical inputs or electronic inputs he can bring these sequences about.

A second area of his activity is involved in managing, monitoring the systems onboard the capsule, such as the power system, making sure that there is electrical power flowing from the batteries, that they are in good condition and if the main battery should fail, going to secondary back-up systems, making sure that the oxygen and environmental control systems are working effectively and if it should fail, going on to a secondary or back-up system, and so on. That same thing is true in communications. All of these major -- and more complex than is generally understood -- systems must be monitored carefully for signs of malfunction, when the man takes over to insure that the flight goes forward successfully and as planned.

A third area of this activity concerns attitude control. As we have already said, the vehicle flies in only generally one attitude under the pre-programmed flight for the automatic system where the man is not aboard. It flies in only our orbit attitude and then goes into the retroattitude and then re-enters. In space it is limited to these two flight programs. However, with the man aboard it can fly in any attitude which is desirable for the purposes of the flight at the moment.

In order for this to occur, of course the man must take over control through his control stick and control the attitude of the vehicle, using either his instruments or the external reference systems through the window or the periscope.

A fourth activity is navigation. The Astronaut must know at all times not only where he is now but where is the next safe point for firing the retrorockets and re-entering, and these calculations must be constantly updated as the orbit in which he is in is known with more precision. This information is flowing to him from the ground, but he also has maps, computers available to him within the vehicle so that he can carry on his own calculations should he be cut off from ground information.

A fifth area is communications. In order to properly manage and control the flight, communications must be maintained with the capsule to know where it is, what is happening, what is the status of the onboard circumstances and so on. The man carries on these communications, constantly relaying information about what he is seeing and doing, and how the capsule is operating, to the ground, and receiving in turn from the ground information on the conditions of the range and the recovery on his trajectory and the time at which he should fire the retrorockets to bring him down as planned.

A sixth area is his activities involved in research and evaluation, and I will speak of these at length in just a moment.

But I would like to mention a seventh task which he has which is namely to keep himself in good condition, to meet properly the stresses of high acceleration that come at launch and re-entry, to meet properly the stresses of weightlessness, of heating, and so on, which he may encounter during the flight.

I would like to talk just a little bit more about the research and evaluation activities of the Astronaut because perhaps we hear least of these.

(Slide.)

This first slide lists four of the major activities which the Astronaut will undertake in connection with research activities to learn more about how man performs in space. As Mr. Donlan told you earlier, this has been since the inception of the Mercury program a second major goal of the program, to determine man's capability in space.

Now the first area here is the observations of the space environment and of the earth below him. He can view the earth and the stars both through his window and through the periscope. He can make observations which have not until this date been available to us.

We have some orbiting camera. Most of these do not give us information on terrain color. For example, many of them do not include as large areas within their pictures or the detail visible to the man from space.

Also, he will be able to make observation on such astronomical phenomena as geigenschein, which have not been made so far with our instrumented cameras. He will be attempting to do this looking out of his capsule during the flight.

Going back to No. 1, here is the primary job of any test pilot -- and these men are test pilots on a space vehicle -- this is to observe the function of the system or vehicle which they are flying. They will be reporting to us cues or information about the vehicle which it is either not possible to automatically record or, because of oversight or not knowing what is needed to record, for which no provision for recording has been made.

A man onboard can sense these. For example, he can see changes in the vehicle, he can feel vibration, he can smell things, and this is perhaps important in environmental control systems. He is a good sensor for many conditions which you cannot build into the system automatically.

He can also investigate non-programmed situations. He can find how the vehicle flies upside down, or in unusual attitudes. He can evaluate systems which we cannot evaluate, such as the manual control systems, the window for maintaining attitude, and so on.

A third area of measurement in which he will be involved is measurements of his own activity and performance. He is carrying on a very complex activity. You are probably all familiar with the research that has gone on on weightlessness by putting a man in the back cockpit of a dual cockpit fighter-type plane and flying him through a ballistic orbit and determining what the man in the back seat can do. It has often been pointed out that the man who is flying the plane up in the front seat was carrying on a very difficult activity under these same conditions.

For these flights we will be attempting to measure how well the man in the front seat is doing during these conditions. Since he is carrying on a very complex and difficult activity, we expect to be able to come to some important conclusions about man's capability to fly and operate vehicles in space.

Finally the fourth item, he will, on returning and during the flight, be able to report medical symptoms, his own sensations and feelings, which will give us information on his physiological and psychological processes in space, so that we will be able to determine how well he has adapted to the conditions of space.

This information we believe should be of importance to our knowledge and should make a contribution to the scientific knowledge of man and how he behaves in space. We have been in the past two years already beginning to build up information in this area by having the man experience the large number of novel conditions which will be associated with space flight.

(Slide.)

Here you will see that on these we have listed eight different environmental conditions under which human tests have been performed and for which we have data and information on how the Astronauts as a specific group perform under each one of these conditions: acceleration, short periods of weightlessness, reduced atmosphereic pressure, heat, disorientation, tumbling, high concentration of CO_2, noise, and vibration.

Through this program we have accomplished two things: First of all we have been able to demonstrate that the man, properly clothed and protected and trained, is able to perform satisfactorily under each one of these conditions, and in some cases under two or three of these conditions combined.

Secondly, we have been collecting base line information on each man which will allow us, when he gets into space, to compare his performance and activities during the flight with how he did on the ground under simulated conditions. This should offer us not only information about the basic ability of man to stand up and perform under these conditions, but should provide us with technical information on such things as what types of things need to be simulated in training programs for space flight and so on.

Finally, I want to just stress that this information which we have been gathering through these simulations is already coming in; much of it is available. All of the Astronauts have already made contributions through participating in this sort of program. So that much knowledge has been gained while we were yet earthbound. It is our hope that this can be greatly expanded when our feet get wings.

Thank you.

MR. POWERS: The next speaker on the program no doubt needs no introduction. He is Astronaut Alan B. Shepard, one of seven Astronauts in our program. He will now describe some of the training activities that have been going on for the past twenty-two-odd months.

REMARKS OF COMMANDER ALAN B. SHEPARD, Jr., U.S. NAVY

COMMANDER SHEPARD: Good morning. Welcome to Langley Field. Actually Bob did such a fine job in justifying our existence that he spoiled my only joke. If we start out with the assumption that man isn't necessary and take it from there, perhaps we can tie in with my outline as I had it planned.

I think that the engineers and scientists here who have been forced to live with the eccentricities of electrical and mechanical systems aboard the capsule appreciate the help that the human computer can give them. By the human computer I mean, of course, the pilot on board. Bob spoke of reliability. Of course, this is only one area in which the human computer works. If you accept the fact that the human computer is there and is needed, then, of course, you are faced with the problem of how do you train the individuals.

When we first came here, I guess a year and a half or so ago, of course there was no formal academy for teaching the science of astronautics. And at the moment there are only a handful of astronauts in this country. I suppose in looking over our training program in retrospect we have developed to a degree an academy, an academy which has many facets and which is made up of facilities in many locations throughout the country.

This morning I would prefer, in retrospect again, to deal with the astronaut training program not in terms primarily of the mechanisms which we have used and are using, but in terms of what it means to me essentially as we are here today with our group in a trained condition.

I think the one thing that strikes me as I look back on the training program is that it has really built a feeling of confidence. I think this may be the real key to our training program, the building of this feeling of confidence. The feeling, I think, is really three-fold: It is a confidence in the people with whom we work, our colleagues, our associates here in the Space Task Group; it is a confidence in the systems in which we are dealing and will have to deal in our flights; and, of course, it is a confidence in ourselves.

Using these three areas, these three definitions of confidence, how do we treat each one? In the first, in the area of confidence in the people with whom we work, we have been given executive responsibilities. In the second, in the area of confidence with the systems aboard the capsule, the systems aboard the booster, we have been given engineering responsibilities. And in the third, in the area of self-confidence, we have been given specific training tasks in a pure piloting function.

Going back to the first, and the second, really, it may sound rather strange that you train a man for space flight by giving him executive responsibility and by giving him engineering responsibility. But these two areas have not been stressed in our past releases, past stories that have been written about the program, so I would like to deal with them for just a minute, if I might.

In the area of executive responsibility, we as a group and as individuals have been given tasks on committees and we have been training for tasks in the range tracking stations, as Mr. Williams pointed out in his speech. In these areas really we are working with the individuals of the Space Task Group as well as those of the various contractors.

As you all know, once you have been given the task, your interest is immediately peaked. I can't think of any stronger motivation for an individual than having been given the responsibility for doing some.

So I think in these areas, though we have been given responsibility, it has helped us because it has made us work with the individuals in whom we must have faith because obviously a major part of the engineering systems and a major part of the programs here have been planned by hundreds of other individuals with whom we have worked. So we obviously have to have this faith and this confidence in them. And the fact that they have given us the opportunity to serve in an executive capacity has helped us to develop that confidence.

In the second area, the area of engineering responsibility, as you know primarily we are pilots. We have had perhaps more engineering education than some of our contemporaries, but we are really not engineers. However, on the other hand our thoughts, our feelings with respect to the capsule and its engineering systems have been requested. We have been asked to participate, again on committees, and again in discussions with engineers, and the particular thoughts and feelings that we have had with respect to the cockpit areas and with respect to the pilot functions have been considered and are being considered.

I might add here that since we are really still members of the Department of Defense this is a very fine example of the cooperation that has existed between the DOD agency and the NASA agency. Once in a while people call me "Commander," but other than that there are very few direct references to my job in the Navy.

We have enjoyed a very fine work relation with the people here at the Space Task Group which, of course, is the direct function of Mr. Bob Gilruth, the Director of the Space Task Group.

In the engineering responsibility area there is one other facet which has entered into our training and that is that of the pure classroom as at the Academy, and that was set up here using the facilities of the Langley Research Center, using the engineers that were here and in these various aspects for many years, using their knowledge to set up a formal classroom study group for us.

From the standpoint of engineering, the second part of my talk, we have had the responsibility in discussions, we have the opportunity to have more formal experience and education in the engineering aspects.

In the third area of this confidence building program, the self-confidence area, we have a whole host of devices and machines with which we have trained and are training. Most of these at the start of the program were provided by the various agencies of the Department of Defense. As Bob pointed out, quite a few of those were either Air Force or Navy facilities. Since that time we have been able to develop some of our own here at Langley Field, and some of these devices you will actually see today.

I don't know just how you build self-confidence within an individual, but I think one very fine way of doing it, particularly if you have an individual who has demonstrated his ability in an area, such as a pilot has, is if you provide him with the opportunity to continue to demonstrate his ability to live within this field, that is one very good way of building confidence.

If the Space Task Group had hired race track drivers for this flight they could have provided them all with Mercedes 300 SL's, or if they had hired a trapeze artist they could have provided him with a trapeze. They have chosen to provide us with the opportunity to fly airplanes. This is a very important point. If you hire an individual with a demonstrated ability, to continue to keep his self-confidence at an adequate level to provide an environment with which he is familiar and with which he can continue to demonstrate his ability. So we have had the opportunity to continue to fly in high-performance airplanes, which of course was our forte before Mercury.

Then we have had the opportunity to meet some rather strange situations. I would like to divide these, trainers and mechanisms, into two basic groups, static and dynamic. When I say static, I really mean that the trainer is firmly attached to the ground. Of course, conversely dynamic means the trainer is being moved sometimes at rather rapid rates. This doesn't mean that the static trainer doesn't tell us something. Strange things happen inside.

As you will see this afternoon, one of our procedure trainers is probably one of the most complicated pinball machines that you will ever see, with the things that happen inside the trainer, though the trainer itself isn't moving.

What I am trying to indicate here in this business of building confidence with respect to piloting ability is that it requires both types of trainers. It requires one that moves and subjects you to stresses of acceleration, and it also requires one which is static and which can provide varied problems for you to solve.

Along the lines of the static trainers, one of the most important we have here is the procedures trainer, as we call it, which is nothing more than a computing mechanism and a timer. The timer starts when the simulated flight begins on the pad and continues to run. As it runs it initiates various electrical signals which show you that you have lifted off, that acceleration is building up, that the noise is increasing, the attitude is changing, the booster has stopped firing, that you have separated, and so on throughout an entire flight. I think you will find this very interesting when you have the opportunity to see that. It provides us with the capability of going through these normal missions, using the timing mechanism, and also of preparing ourselves for emergency situations, for failures or eccentricities which crop up during a flight. This is a static trainer.

Another static trainer with which we have had a great deal of success is pressure chambers. We have used pressure chambers at Philadelphia and we intend to use one in our own hangar facilities at the Cape to test out our reactions to these pressures and to test out the reactions of the suit.

On one occasion, in a chamber in Philadelphia, we also threw in the additional environment of heat. We provided heat and low pressure at the same time to analyze air flows, ventilation, and so on.

Another static trainer which we used up at Bethesda was a chamber equipped to provide various levels of carbon dioxide so that we could use ourselves as a somewhat dull but maybe appropriate sense of too much carbon dioxide in the system.

We have used the planetarium at the University of North Carolina for some of our star studies.

We have used various trainers here, small ones primarily, designed by the engineers to train for a specific manual function.

On the dynamic side the one we have used the most actually is a device called the Centrifuge at Johnsville, which provides accelerated force. This is a sort of ice cream separator, where you get on the end of a long arm that twirls you around faster and faster and soon you are being squeezed out the bottom of the seat that you are sitting in. If it is tied to a computer it does provide a real fine example of accelerating force coupled with control testing. The control test here is using a computer and electroservo mechanism moving little gauges which indicate certain things that are happening, that the capsule is changing its attitude, for example, and you as a pilot, while you are being squashed, are forced to react properly, using the various over-ride manual controls in the cockpit. That centrifuge coupled with the control task and the dynamic situations has been one of our most important trainers.

We have also, as Bob pointed out, trained for zero "G" conditions, using various types of airplanes.

We have also used a device at the Lewis Laboratory in Cleveland which is the largest sized cocktail shaker you will ever find. It consists of a pilot seat and instrument panel and a control stick which is mounted on a gimbal which is mounted on a gimbal. So you have three axis of rotation. The whole thing is not run by steam but it is run by compressed gas, and it can be controlled -- spun up in any one of three directions or a combination of all three -- either from the outside or from the inside. We use this as a disorientation training device.

We assume in this instance, for example, that we came off the end of the Atlas or the Redstone and the automatic control system, the autopilot, had failed, and the thing came off in a tumbling attitude. How well could we react in this particular situation. I assure you that most of us reacted in a nauseous reaction. After a period of time, spinning around, it just got a little bit sickening.

I think this pretty well covers the devices that we have used, some of which you will see this afternoon. But the thought that I want to leave with you this morning is that really I think the most important thing is that all of these areas tied together -- that is the area that they have given us for executive responsibility, for engineering responsibility, and for the pure task of learning pilot functions -- have tied together to build the confidence level that is necessary for training for space flight.

MR. POWERS: I can't believe it. It is thirteen and a half minutes after twelve, and we were scheduled to finish at 12:15.

(Thereupon, at 12:20 p.m. the meeting recessed for lunch.)

AFTERNOON SESSION

(3:40 p.m.)

MR. POWERS: Gentlemen, in a couple of minutes we will pass to you the "If" paper, and a copy of the House Space Committee report which Dr. Glennan suggested this morning that you might want and maybe didn't get. It was released a week ago Friday. We spirited it down here and had it reproduced. I hope we have been successful in raising your Mercury I.Q.

At this point if you have questions which have arisen, of long standing or those which have arisen today, Mr. Bob Gilruth, Mr. Walter Williams and Charles Donlan are here on the platform. Dr. Stan White is with us, Dr. Voas is with us, and a couple of the Astronauts are here.

QUESTION: I would like to raise the question of the capability of the Mercury Project based on the Atlas. I raise this question in the context of the report which was issued today by the Advisory Committee of President-elect Kennedy on Space in which they say:

> "The present Mercury program based on the Atlas is marginal, and if the Atlas proves inadequate for the job it may be necessary to push alternatives vigorously."

MR. GILRUTH: I think they also mention the Titan.

QUESTION: Yes.

MR. GILRUTH: There are really two points I want to cover. One is relative to Atlas-Titan and the other is relative to the capability of Atlas as we see it.

When this program started, of course, we gave very serious consideration to both the Titan and the Atlas. At the time Atlas was further ahead and it is still ahead in the development program, over Titan.

Another thing about Atlas that we liked, and still like, is that you light off all three rockets on the ground. In Titan you are involved with the ignition of a second stage, which is perhaps a small point as the reliability of these devices gets better and better, but it is probably still a fairly important point in today's technology.

As regards the Atlas, as you know we flew an unsuccessful mission at the end of last July -- July, 1960 -- where an incident occurred 60 seconds after lift-off where the vehicle disintegrated. This caused us to institute a very intensive program of testing of both our own -- McDonnell's own -- capsule adapter and also the upper part of the Atlas. Vibration programs were run, wind tunnel programs, various analyses.

And there was another incident which occurred in the last moon shot, Able V, where there was another failure, again involving a non-military type payload on Atlas. As a result of all of this we have done two things: we have strengthened the adapter that goes between the Atlas and the Mercury capsule and we have also instituted a plan to strengthen the upper part of the Atlas. I can't describe this in detail to you because of the classified nature. This is being done and we are very hopeful that this will do the job.

We are also instrumenting the upper area, the interface area, very heavily in the next several shots so that if there are additional failures we will have a better chance of pinpointing directly.

There is one other point I would like to make relative to Atlas and Titan. You don't just pick up one of these payloads and set it on another booster. The integration job is more complex than this. I would like to make clear that a change to a different booster this far along the program would not be a simple short-time business.

QUESTION: In making your change in the Atlas, how much time delay is this causing between now and the next launch of an Atlas? I don't mean for you to pinpoint the date, but I mean how much more time is needed to make the changes in Atlas before you would be ready then to go itno whatever you would go into in preparing this?

MR. GILRUTH: This is a difficult question for me to answer right at this time. We hope to do this without very substantial delays in the program.

QUESTION: Do you still hope for it in the current quarter of this year?

MR. GILRUTH: I would say we may not have the entire change that we want to get done in this quarter, but we will probably be flying the Atlas with an interim strengthening in the first quarter of the year.

QUESTION: Then you will have an MA-II this quarter, but the change won't be completely made and the completely re-worked Atlas will not be until the second quarter?

MR. GILRUTH: I think this is approximately correct.

Do you have anything you want to add to what I have said, Walter, or Charlie?

MR. WILLIAMS: When you talk of capability of Atlas, we feel that with our present capsule weights, unless it was an abnormal -- I emphasize "abnormal" -- growth in weight, we do have adequate performance capability. It will transport the capsule, and it will transport it fast enough.

QUESTION: Do I get it, then, that you really would recommend changing to a Titan at this stage of the game?

MR. GILRUTH: No, indeed.

QUESTION: You don't recommend, or do recommend? What do you do?

MR. GILRUTH: I would not recommend changing to a Titan at this stage.

QUESTION: You would say Let's keep going with the Atlas?

MR. GILRUTH: Yes.

QUESTION: If you were to change to the Titan, how much time would you lose?

MR. GILRUTH: I would hate to make a guess at that.

QUESTION: Do you still believe that you will be able to orbit an astronaut in calendar 1961?

MR. GILRUTH: I think, to use a trite phrase, if the tests go well it is still in the cards.

QUESTION: Mr. Gilruth, there was some talk a short time ago about today being the day on which you would narrow down the seven astronauts to three or four. Can you tell me why that wasn't done? Is there any reason for that?

MR. GILRUTH: I don't know where these reports originated. They did not originate from me. I will say what I have to say about astronaut selection at this time.

There will be an astronaut selection in the near future. Quite obviously more than one astronaut will be selected because you obviously need alternates for these early flights. The selection will be based on the medical and technical data that have been accumulated during the training aspects, study aspects of the project. The selection has not yet been made.

This is the essence of what I have to say.

QUESTION: You say " the near future." Is that a matter of days, or what? -- and how many would you then pick for alternates?

MR. GILRUTH: The selection will be made in adequate time to support the first manned flights, and this is about as far as I want to go.

QUESTION: What kind of training will you give this group of astronauts that are selected before a flight? Do you put them into a specified type of training, either ability or medical?

MR. GILRUTH: I will call on Walt Williams to respond to that one. It is pretty straightforward.

MR. WILLIAMS: The problem then becomes one of --

QUESTION: Repeat the question.

MR. WILLIAMS: The question is, Will there be any specialized training, or what will the astronaut activities be?

I think the problem then becomes one of the astronauts selected for a particular mission to spend their time becoming familiar with the particular mission that they are going to fly, the particular capsule in which they will fly.

There will be numerous day-by-day decisions as the capsule is prepared for flight that the astronaut should participate in.

During the system checks of this particular capsule that they are preparing on the Cape there will be duties required of the astronaut. He will participate in these tests. But I see no additional testing of the kind Alan Shepard described this morning, centrifuge testing, or things of this sort. There will be a chamber test of the capsule at the Cape. The astronaut will be in the capsule at that time.

QUESTION: Is he going into a health-conditioning training program of that type?

MR. WILLIAMS: I think these people are all very fit right now. I don't see how they can be much fitter, so to speak. I wouldn't anticipate any special physical culture during this period prior to a flight.

QUESTION: Will that person likely be the one who makes the first orbital flight?

MR. WILLIAMS: That is not necessarily so. We will probably have a number of Redstone flights prior to an orbital flight.

QUESTION: It has been pointed out a few times that in addition to all the other things the astronaut is going to do to keep this machine running, that he will do some scientific things. These were glossed over very rapidly this morning. I wonder if we could have in detail what specific scientific projects have been selected, if any, for him to do?

MR. POWERS: Bob Voas, will you respond to that, please?

MR. VOAS: I think this morning I indicated four areas which we might call research and evaluation tasks of the astronaut. The first one of these is the task which is typical of any test pilot operation, any task that a test pilot does, and this is to evaluate the vehicle. I think, as we see it, the first task which the astronaut will be involved in is actually checking out the vehicle manual systems to see how these work. For example, on our MR-I shot we did not use the manual control system. On other manned shots, for obvious reasons, we will not use the manual control systems. It is only when the man is in there that you can make use of these to see how they work. And so in doing this we will get our first information. The early short flights will be stressing this evaluation of the vehicle as a Number One item: how do the manual control systems work; how does the periscope work; what can he see through the periscope, and, later, what can he see through the window? This sort of material.

As we get into the orbital flights where more of the astronomical observations become possible, we are getting advice here from our scientists within the NASA on what sort of observations will be available and possible with the vehicle as we have it.

When we get closer to the orbital flights I think we will be discussing in more detail these types of scientific observations. The observations three and four, on how well the man performs, and the medical observations on how well he stands up physically, will be a part of every flight.

The medical observations are done on a pre-test basis. Before any flight the man receives a physical and immediately after the flight he receives a physical. Changes can be noted, if any should occur. We do not expect any major changes, of course.

Also we will be measuring, for example, how well the man controls the attitude of the vehicle. Present plans call for him to have control most of the time during the early Redstone flights. During the time he is in control we will be calling for a particular attitude, orbit attitude, banking, pitching, whatever it is. We will have second-by-second records of what the actual attitude of the vehicle is. We can, by looking at these records, determine how well he is doing, and how well the control systems are doing.

QUESTION: So there is no real scientific project that you have in mind, outside of these developmental things?

MR. VOAS: I don't think that anybody knows how well a man can perform a complex tracking task during five minutes of weightlessness. If you have this answer, I wish you would come forwqrd with it. If it is not science to get the answer to this, then I don't know what science is.

MR. DONLAN: I am glad you asked that question. If there isn't anything scientific about putting a man up in a weightless condition for several minutes to find out how he operates, I wish you would define a more scientific area for us. This is sometimes overlooked.

The kind of scientific activities you want him to do will, perhaps, come later. Before you can even determine what scientific activities he is capable of, you have to do the basic thing in planning out what is basic. That is one of the key purposes of this program.

QUESTION: If you find that the astronaut has good control and can do things and do about what you want him to do up there, how would this affect the design of either this series of capsules or the follow-on series? Would you give him more duties instead of building them in automatically?

MR. GILRUTH: I think there are really two things. One thing that is very important is: Is it possible to fly for protracted period s of time in a weightless condition? That is something we cannot determine on earth because there is no known way of creating zero gravity without getting the orbital speed, as you know, of course. This is one of the very important problems, the answer to which should be in hand before you can really design for much longer missions, space missions.

The other part of my answer is: Yes, we do feel that ultimately in space vehicles one will get much greater reliability and flexibility by having a degree of automation that is more like that now in our jet transports where the crew is in command, where he uses automation only as a servant to him, but the command decisions are made on board.

Mercury, as you know, the initial flights have to be made automatically. The man is put into this automatic system and we have striven to give him all of the overrides and all of his own control that we possibly can. But if we knew more about manned space flight, we think we would be able to go a little more closely to the jet transport type of control. We are looking toward this day.

QUESTION: Mr. Gilruth, I wonder if we could define a little more specifically what manual operations the astronaut will perform in the first Redstone shot. For example, you just got through saying that most of this will be automatic. A few moments ago we heard that the astronaut will have control as much time as possible. I wonder if we can clear up a little bit just what his duties or approximate duties will be on this first shot.

MR. GILRUTH: I think that in the manned Redstone flights we want to give the pilots all the time we can on manual control. This will permit him, as Dr. Voas has pointed out, to reorient the capsule to other attitudes, to make observations, and to feel out the vehicle. The time is rather short, however, for any very extensive wring-out of the system.

QUESTION: But there will be, for example, some exercise in attitude control?

MR. GILRUTH: Yes, this is the plan at the present time.

QUESTION: What would the time be?

MR. GILRUTH: I beg your pardon?

QUESTION: What would the approximate flight time be in the Redstone?

MR. GILRUTH: I think it is fifteen or sixteen minutes from launch to water landing. About five minutes of weightlessness.

Isn't that right, John?

COL. GLENN: 5.2 minutes of weightlessness.

QUESTION: Did you say a while ago even roughly when the first Redstone flight would be?

MR. GILRUTH: I would rather not get pinned down on the answer to that question. We still have a lot of flights to make before manned flight. So much depends on how well these work as to just what the date is that I would rather not get pinned down.

QUESTION: Did I understand you to say that you have several more flights to make before manned flight?

MR. GILRUTH: Yes.

QUESTION: With the Redstone?

MR. GILRUTH: Oh, I don't know how many Redstones. At least one.

QUESTION: By "manned flight" do you mean manned orbital flight?

MR. GILRUTH: No. No, I mean just sub-orbital flight.

QUESTION: I would like to ask Dr. Voas: After observing the astronauts, if he has found a common area in which they appear to have a vulnerability that would apply to the general population.

MR. VOAS: I am sorry. Would you repeat what you said about vulnerability?

QUESTION: If the men appear to demonstrate a common area of vulnerability that might apply to the general population under duress, stress, and so on.

MR. VOAS: The question is, do the men -- the seven astronauts, I assume -- seem to demonstrate an area of vulnerability --

QUESTION: Common vulnerability.

MR. VOAS: -- common to all of them that might apply to the general population.

I am not quite sure what you mean by vulnerability. We have had them through every one of the stresses or unusual conditions.

QUESTION: Let's say isolation, in an area of isolation, or sound.

MR. VOAS: I don't believe we have found any of these with which we cannot cope satisfactorily. By "cope satisfactorily" I don't mean just live through, go through undamaged, but I mean actually control. I think one of the heaviest stresses they come under perhaps is accelleration, and they have demonstrated that they cannot only withstand this accelleration successfully but that they can also control the vehicle while under this accelleration.

QUESTION: I wonder if you would discuss two aspects of the program which have probably led to the greatest question of the Project. One is, what do you expect the Project to cause; and two, to what extent has your time schedule slipped?

MR. GILRUTH: Relative to the first question, I think that the program as it is going today and as it is laid on to date, the cost phase of that is pretty much as summarized in the House Space Committee report. You will note in there that they have projected the cost to a considerably higher figure than the $293,000,000, I believe, which is the figure which carries it through Fiscal 1961. The reason they give for raising this to $500,000,000 is a pad against flight delays and difficulties along the line.

None of us know what this will really amount to. There is some contingency -- I hate to use that word; it is not a real contingency, it is just having certain backup boosters, and this sort of thing in the present plan. So that I don't think anyone can say at this time or at this stage of the program what its ultimate cost will be. It will depend also to some extent on whether one decides to go further in flights with the Mercury beyond the initial orbital flights.

The second part had to do with program slippage. My own feelings on this are these: This is a very complex program that we undertook. As Dr. Glennan pointed out, it gets into areas, many areas that have never been done before. It is a frontier type of effort that involves reentry from orbital speeds, flight on large liquid rockets with new concepts such as the escape system concept. All of these things put together in one project makes it very difficult indeed for anyone to estimate what the real time required will be.

The time we are taking is somewhat greater than our earlier estimates. This is true. They are early target dates. However, I do not believe in retrospect that I see any way in which the project could have been done more quickly. So in this sense I would say the program has not slipped; it is taking the time it has to take in order to do a project like this.

QUESTION: Of primary local interest, what are the plans, if any, for geographical move of Space Task Group from Langley and expansion of personnel?

MR. GILRUTH: The only thing that has happened, to my knowledge, is that the tie between the Space Task Group and the Goddard Space Flight Center has been severed. There are no plans that I know of to move the Space Task Group from its present location. Although, also, there are no plans that I know of that say it will stay here indefinitely.

QUESTION: Would you assume it will stay here at least for the life of Mercury?

MR. GILRUTH: I think that is a good assumption.

QUESTION: How about the expansion of the staff?

MR. GILRUTH: I know of no immediate relief to our manpower shortage.

QUESTION: Doctor, you said earlier that it has taken somewhat greater time than you had previously estimated. Then you said later that it has not slipped. Can you give us an idea of what you mean by it has taken somewhat greater time than our earlier estimates? How much in terms of three months, a year, or what?

MR. GILRUTH: I think when we started this some of us were talking about orbiting in about two years after go-ahead, which would have meant that we would have just now been orbiting. Quite obviously this was optimistic.

QUESTION: Dr. Gilruth, after the end of the Mercury program and before your first flight with the Apollo, there will be a period of several years -- three years or maybe more. What sort of man-in-space activities do you think we will be conducting then?

MR. GILRUTH: I believe that the Mercury vehicle will have a number of useful flight programs. In other words, I believe that once we demonstrate the flight of this vehicle there will be a large number of avenues opened up that will be in need of investigation. I believe that it will be fruitful to fly Mercury capsules for more than the initial part that is now programmed.

QUESTION: Can you describe some of those avenues which might be opened up?

MR. GILRUTH: I can see, for example, that in a more sophisticated vehicle having let's say a guidance system which allows the pilot to determine his landing point from a display that is onboard, I can see the desirability of flight-testing such a system, which might be done in a Mercury capsule. There are undoubtedly other systems that would represent improvements over these first steps we have made with Mercury.

You would stand to gain a lot by actual flight tests. There are undoubtedly things that we can't even imagine right now that we want to explore, as you always do when you go into any new frontier.

QUESTION: Do you have any plans to recruit any further Astronauts? If so, when?

MR. GILRUTH: We do not have any actual firm plans right now for any further recruitment of Astronauts, although this no doubt would occur with any new large program if it were instituted.

QUESTION: The ten-year plan at present calls for the first flight, manned flight of the Apollo capsule in 1968 to 1970. Is this as fast as we can go?

MR. GILRUTH: I don't feel that what I might say on this would really cut any ice or carry any weight because just what the future manned space program is going to be I don't think will be up to me to speculate on.

QUESTION: Mr. Gilruth, obviously you have run into technical difficulties here. I wonder, from the standpoint of your Astronauts, are they trained and ready to go at this point?

MR. GILRUTH: I firmly believe they are. I might call on one of the Astronauts. I think Alan Shepard's talk to you this morning was fairly revealing in this regard. And I see John Glenn there. I don't know whether you want to work with them or not.

COL. GLENN: We will give you a one-word answer: Yes.

QUESTION: I was going to ask also if you might not give us a status report on some other components in the system. What else is ready to go, and what isn't?

MR. GILRUTH: The MR-1, which you just looked at in the building across the way, has most of the systems aboard it that the orbital capsule has. There are some systems that are missing. The environmental system was missing. Some of the communication gear was not onboard. I believe the satellite clock, or what we call the clock -- it is really a comman receiver, timer, and programmer -- was not onboard. This satellite clock device has not finished its final qualifications test.

The environmental system I think has come out of the woods. I believe all the major systems are coming down the line and coming together so that I don't know right now of any major system that we would have to have that would be a controling deterrent on the normal flight.

We have discussed the booster problem. This obviously is a very important problem, and the answers to this will be controling.

QUESTION: How about the world-wide tracking network?

MR. GILRUTH: The scheduled completion of this is compatible with orbital flight this year unless we run into difficulties on the check-out, crew training, and this sort of thing, which is only partially complete.

QUESTION: In other words, you would say that everything is ready right today, with the exception of the tracking system, world-wide?

MR. GILRUTH: I would say that the individual components are. But these all have to go together, work together, and have to fly together before we really know whether they are ready. In other words, we are able to go ahead with this flight program at the present time.

QUESTION: Do you have any hope to beat the Russians on this flight?

MR. GILRUTH: I don't have any idea of what the Russian plan is. We are running our own program and trying to keep our eyes on the ball. Just what they are going to do and when I haven't the faintest idea.

QUESTION: We have had a couple of estimates given on the decay time of an orbital flight if your retrorockets for some reason didn't work. Could you give me your assessment of what this would be?

MR. GILRUTH: As you know, the decay time depends on the weight or mass per square foot of the vehicle and the altitude or density in which it is flying.

QUESTION: If you put it in a hundred mile orbit, put it in your programmed orbit and everything functioned except your retros.

MR. GILRUTH: The decay time would be fatal, I believe.

QUESTION: Pardon me?

MR. GILRUTH: The decay time would be fatal. It would be just like having an engine failure in a single-seater airplane in the middle of the Atlantic. In space flight one of the kinds of failures that can occur is different from what we are used to in the atmosphere. If your engine quits, you don't crash. You stay there. But it is nonetheless fatal if the engine quits at the wrong time in a space craft. I don't think we will ever be able to get a method of operation where the orbital height is low enough so that a failure of retrorockets would not be a very serious thing indeed.

QUESTION: You said everything is individually ready. The last test of the escape system on November 8 and Little Joe V, something went wrong there?

MR. GILRUTH: Yes.

QUESTION: Could you tell us what went wrong and where we are on that?

MR. GILRUTH: Yes. We think we know what went wrong. We deduced what we thought went wrong from the records obtained during the flight, and then later on during the week the Navy recovery crew actually found the guilty part.

QUESTION: What did they find?

MR. GILRUTH: The guilty part, a malfunctioning switch.

QUESTION: What went wrong?

MR. GILRUTH: This was on Little Joe.

QUESTION: That escape tower in the hangar; was that the --

MR. GILRUTH: It was one like that. It is a malfunctioning switch on the clamp ring. We have changed the wiring, or the physical hookup of these limit switches in the subsequent capsules, and we believe that we have solved that difficulty. We are going to repeat the flight.

QUESTION: Must that repeat precede MR-3? Will that repeat, Little Joe VI, have to repeat MR-3 and will it have to be successful in order for you to go ahead with MR-3?

MR. GILRUTH: I would think so. Yes.

MR. POWERS: We are talking about components being ready. Don't forget that these are still man-made devices. Even though we say that the components may be ready it still means that you have to space qualify it, and you also have to build up the highest degree of reliability you can, but you still have a man-made piece of equipment that is subject to failure.

QUESTION: Dr. Gilruth, you say you are working now to strengthen the Atlas, the upper part of the Atlas. If your program doesn't succeed in the strengthening of this in the way you now envision it, does that mean that you would call off the manned flight?

MR. GILRUTH: No, I don't think so. I would hope that if that-- Actually, we are getting awfully "iffy" here. Actually, this business is really no different from the aircraft business where you have a trouble and you instrument and you test to find the trouble. You generally can find it if you work at it hard enough and take the necessary time.

QUESTION: When did you order this fixed; or did you order two separate fixes? Did you order a fix on the adapter ring and then, after the Atlas-Able failure, did you ask for a fix on the upper part of the Atlas? Were there two separate things?

MR. GILRUTH: I might say to that that we have been working on this intensively ever since MA-I, which is the end of July. I don't think I ought to try to pinpoint this as to when each thing was done, in the sequence.

We have gone over everything that we could possibly test on the ground, as I mentioned before, with wind tunnel tests, also to get a better or more detailed determination of possible loads, trajectories, the angles of attack during the flight, wind shears, gust loads -- just about everything that you can think of that could possibly be involved has been under intensive study. This is what we have come up with so far.

I don't want to imply that this is necessarily all that we have come up with. In a case like this you go over everything and improve everything you think you possibly can, and then hope that you have found what it really was. You can't ever be sure that you have pinpointed the exact cause of a difficulty like this.

QUESTION: Can you outline the series of successful experiments that must be carried out in the Atlas series before a man goes into orbit?

MR. GILRUTH: I think we have to make these abort -- return from aborted missions that Mr. Donlan has discussed this morning, that give more severe heating on the afterbody than the actual orbiting mission. We have to, we believe-- We would like to insert a capsule in orbit and immediately bring it back, to simulate an orbit that is almost, but not quite, made. We feel that we must have an adequate number of orbital flights. Just what this "adequate" is, we won't know until we see some data.

MR. POWERS: We can have one or two more questions.

QUESTION: I haven't seen the report which John referred to today. In an earlier report from Congress -- I believe it was the House Space Committee -- there was some criticism expressed that some kind of parallel program was not under way at the same time.

MR. GILRUTH: I think we would all like to have enough money to run all the capsule developments and boosters parallel and this sort of thing on a program like the ballistic missile program was done. We just weren't able to do it this way. I think you do buy something, but the costs are a lot more.

QUESTION: Would you, too, like to have had some alternate program coming along at the same time?

MR. GILRUTH: I think anyone would like to cover himself as much as he could. There is no question but what you do buy a back-up system if you are willing to spend the money for it.

MR. POWERS: I would like to point out with regard to the "If" paper, there is one big "if" that that paper doesn't address itself to, and that "if" has to do with the very nature of the program. It is a research and development program. If our research and development and flight tests tell us that we need to do more work, fly more flights, before we send man, that is precisely what is going to happen. That is probably the biggest "if" that should have been written right at the front of that page.

Ladies and gentlemen, it has been a real pleasure having you with us. We hope that we have been able to help you understand our program better, and we hope that as a result you will be able to report our activities better.

Thank you very much for coming.

(Whereupon, at 4:28 p.m., the press conference was concluded.)

Staffs only

Address by

Robert C. Seamans, Jr., Associate Administrator
National Aeronautics and Space Administration

before the

Richmond Chamber of Commerce
Richmond, Virginia

January 12, 1961

SPACE -- FRIENDLY OR HOSTILE?

VIEWPOINTS ON SPACE EXPLORATION

There are three viewpoints on this newest adventure on which man has embarked. First, let's briefly discuss the two extremes. One is the highly colored outlook of the "space fans" -- or, as we call them, "Space Cadets." These starry-eyed people talk as if tomorrow, or at any rate, the day after, space liners will be hurtling to the moon and planets. They paint glowing pictures of pleasure domes on the moon and thriving colonies on Mars and Venus. They speak of settling our surplus populations on the planets and of voyages to planets of other solar systems. I'm afraid, however, that the Space Cadets are indulging largely in imaginative and wishful space opera.

It is true that some of this may come about, in time -- many, many years in the future. But first, a host of problems must be solved and countless difficulties overcome. It is extremely doubtful that any of us here will live to see anything beyond small manned scientific expeditions to the moon and to planets in our solar system.

At the other extreme are the die-hard reactionaries. These people view the space effort as multi-million-dollar nonsense. They say we have too many unsolved down-to-earth problems to be squandering energy, resources, and time in venturing out into space. They say, "Let the Russians have the moon. Who cares?"

We in NASA are in a third category -- located between the first two extremes. We believe that research to obtain better understanding of the universe will -- as it always has -- pay rich dividends, often in unexpected ways. We know that very valuable practical applications of space technology are bound to come. Moreover, the emerging technology of space flight and spacecraft will provide an important stimulus to a large segment of our economy. As I shall point out in some detail, we have a solid basis for this viewpoint.

NASA'S ROLE -- A SUMMARY

For a few moments, let me outline the mission of the National Aeronautics and Space Administration. NASA was two years old on October 1. The agency was created because the President and the Congress felt very strongly that the Nation's space program should not be oriented exclusively to military goals, but should be -- in the words of the National Aeronautics and Space Act of 1958 -- "for the benefit of all mankind."

The need for central direction and coordination in all phases of the U. S. space effort became apparent late in 1957 when Sputniks I and II opened the Space Age. The President's Science Advisory Committee and the President's Advisory Committee on Government Organization recommended that a civilian agency be formed to direct nonmilitary activities. In his special message to the Congress on April 2, 1958, the President emphasized that -- "... aeronautical and space science activities sponsored by the United States be conducted under the direction of a civilian agency except for those projects primarily associated with military requirements. I have reached this conclusion," the President's message continued, "because space exploration holds promise of adding importantly to our knowledge of the earth, the solar system, and the universe, and because it is of great importance to have the fullest cooperation of the scientific community at home and abroad in moving forward in the fields of space science and technology. Moreover, a civilian setting for the administration of space functions will emphasize the concern of our Nation that outer space be devoted to peaceful and scientific purposes."

With such a charter and the heavy responsibilities involved, NASA had to move swiftly to put together an organization capable of carrying out its assigned mission. At its birth, NASA absorbed the National Advisory Committee for Aeronautics, a highly respected 43-year-old aeronautical research agency which had also participated in space research. Two important elements of NASA that were formerly part of the NACA are the Langley Research Center, and the Wallops Space Flight Station, both here in Virginia. To the 8,000 scientists, engineers, and technical and administrative personnel in a Washington, D. C. Headquarters and five field centers, other excellent groups were added to form the new agency. Among these were the 157 staff members of the Naval Research Laboratory Vanguard group on November 30, 1958, and on December 3 the approximately 2,500 people of the Jet Propulsion Laboratory, which is operated under NASA contract by the California Institute of Technology. On July 1 of last year, more than 5,000 people of the Development Operations Division, Army Ballistic Missile Agency, Huntsville, Alabama, were added. Today our total strength -- exclusive of the Jet Propulsion Laboratory -- is more than 16,000.

We now have an all-around space research and development capacity. In this regard, may I emphasize that despite NASA's necessary growth during the last two years, we are determined that private industry shall get an ever-increasing share of NASA budget dollars. Industry participation currently amounts to more than 75 percent of those dollars. We feel that the NASA staff should be kept at the level required to plan the space exploration program and to organize, contract, over-see its implementation, and to conduct sufficient in-house effort to maintain the calibre of our scientific and technical personnel.

WHY LEAVE THE PROTECTION OF THE EARTH'S ATMOSPHERE?

Man has been striving continuously to gain altitude, to push back the horizon, and to gain a better view of his surroundings. The climbing of mountains, the use of balloons, aircraft, rockets, and now satellites, have continually improved his perspective. Obviously, the greater the altitude of the satellite, the larger the area that can be seen at any given time. For example, a satellite approximately

1,000 miles over Kansas City can view the entire East and West Coasts of the United States.

Altitudes above the atmosphere are important for still another reason. The atmosphere filters much of the radiation which exists in the universe. Since we cannot "look through" the atmosphere except in the visible range and at limited radio frequencies, our understanding of the universe is naturally limited. This is why we are developing an Orbiting Observatory Satellite that will place astronomical instruments in orbit to observe the planets, sun, stars, and nebulae. For example, these instruments will measure ultraviolet radiations--most of which never penetrate the earth's atmosphere. Such measurements will permit us to estimate the temperatures, densities, and contents of the stars.

You are all familiar with orbits and their predictability. We have been announcing when E cho will arrive over many cities in both our own and foreign countries. The actual time is always within fractions of a second of the estimated time. The forces -- other than gravity -- that affect a satellite are so extremely small that spacecraft travel effortlessly in nearly perpetual motion, unlike their atmospheric counterparts that require massive amounts of power to maintain supersonic speeds, which are far less than orbital velocities.

We leave the protection of the earth's atmosphere to gain a better view of our surroundings, and to gain a "free ride" once orbital speeds are achieved. We can also make a variety of measurements in space which, in the past, were beyond our capabilities. We can collect samples of dust called micrometeoroids, and we can gain a close look at, and land equipment on, the moon and planets. However, there are serious technical problems that stand between us and the utilization of space.

HOSTILE EFFECTS IN SPACE

Space is alien to human life and experience. For a long time, scientists conceived space to be pure emptiness, a cosmic nothingness, a waste devoid of everything except rare metors and comets. Now we know that it is far from empty; space is pervaded by extremely diffuse gases and fragments of solid matter, ranging from microscopic cosmic dust to stony or metallic meteors weighing tons. Some astronomers estimate that matter existing in space between planets, solar systems, and galaxies weighs about 200 times more than the trillions of stars in the universe. Others estimate the factor as 10 rather than 200. There is general agreement that there is much more matter unseen than seen. Although dispersed and separated by immensely vast distances, this cosmic material must be reckoned with in planning spacecraft and missions that will eventually take men to the moon and the planets in our solar system.

One of the most important results of space investigation to date is the discovery by James Van Allen of the Great Radiation Belts surrounding the earth. These are belts of energetic particles, composed of solar and cosmic radiation trapped in the earth's magnetic field. U. S. satellites and probes (Explorers I, VI, VII, and Pioneer V) participated in the discovery and investigation of this radiation region. Before 1958, radiation was not considered a hazard for the future space traveler. It was believed that most radiation encountered would be visible light, ultraviolet, or X-ray, and that the intensities would be low enough to cause no damage. However, with the discovery, first of the Great Radiation Belts and, later, of the solar proton beams, the entire picture of space travel changed. The radiation regions around the earth and the planets appear stable, but the outer portions fluctuate in intensity and extent in response to solar activity. Space also contains a low-energy particle radiation emitted by the sun. The characteristics of this radiation have not been fully determined, but space probes indicate that during periods of high solar activity, the intensity of these particles is not nearly as great as that of the Great Radiation Belts.

A body in space lacks the protective thermal cloak supplied by the atmosphere. Temperatures can vary widely, depending upon the orientation of the vehicle with respect to the sun's radiation. Like the moon's surface, the temperature of the body facing the sun can reach the boiling point of water, whereas the shady side can be several hundred degrees below zero. A manned spacecraft must be carefully designed to provide a uniform room temperature inside the cabin. Re-entry poses an even more difficult thermal problem since the friction of the air at orbital speeds yields temperatures that melt most metals. The use of special thermal techniques is required in order to avoid a fiery re-entry.

During launch and re-entry, large external forces act on a space vehicle, in the first instance, from the thrust of the rocket motors, and,in the second, from the drag of the atmosphere. At other times during the mission, except during orbital transfer, external forces other than gravity are at an extremely low level. Since all matter experiences the pull of gravity in an amount proportional to mass, a floating or "weightlessness" is experienced, similar to a quick drop in an elevator. The effect, for long periods of time, of weightlessness on fuel flow, control equipment, and human beings is not known at this time. However, this effect must be included in calculations for the design of space vehicles.

These are some of the factors which influence or are hostile to space flight. As was the case with the famous sound barrier -- felt by many to inhibit flight at speeds greater than sound -- these obstacles can probably be circumvented. The important question is, what do we wish to accomplish in space?

WHAT IS OUR SATELLITE PROGRAM?

As stipulated in the Space Act of 1958, NASA is required "to develop and operate space vehicles for a variety of purposes." These purposes can be roughly divided into these categories: unmanned scientific exploration, manned space flight, and application developments. The budget includes funds for a variety of unmanned scientific satellites, Mercury launchings, and satellites for development of meteorological and communication systems. Also included in the budget are funds for research and study of many additional satellites which will be flown in future years. Obviously, time does not permit a detailed discussion of the various aspects of our satellite program but here are several of the highlights.

Unmanned Scientific Exploration

As I have already indicated, we have planned a large number of unmanned scientific satellites. The purposes of these satellites range from investigating the earth's atmosphere, the ionosphere, the energetic particles and fields about the earth, to investigating the sun and the galaxies. These satellites have been specially tailored to each particular mission or series of missions.

Among our most successful experiments to date have been the Pioneer series of space probes. Pioneer V, for example -- launched into solar orbit on March 11 of last year -- was tracked into space to a distance of 22.5 million miles, by far the greatest distance any manmade object has been tracked. Pioneer V sent back scientific data on conditions in space until communication contact was lost on June 26. This space probe gave us new and valuable information about cosmic rays, the earth's magnetic field, solar "storms," and evidence of the existence of a large "ring current" circulating around the earth at altitudes of from about 30,000 miles to 60,000 miles.

Launch vehicles, such as the Agena and the Centaur, will soon be available, with greatly improved load-carrying capability. Detailed plans have been made and work will soon begin on an Orbiting Geophysical Observatory, based on the use of the Agena. This observatory will be one of our first standardized satellites, with a stock-model structure, basic power supply, attitude control, telemetry, and command system. Its modular compartments are capable of carrying 50 different geophysical experiments on any one mission. For this reason, it is often referred to as the "streetcar" satellite. The observatory will be about six feet long by three feet square. The two solar paddles used to collect energy from the sun will be about six feet square. The satellite will weigh 1,000 pounds and will include 150 pounds of scientific experiments.

The first mission projected for the satellite will include a wide variety of experiments, performed in an eccentric orbit having an apogee of about 70,000 miles and a perigee of 170 miles. An Atlas-Agena is scheduled to launch this mission, called EGO.

About nine months later, a Thor-Agena will launch POGO, a polar orbiting geophysical observatory with apogee of 650 miles and perigee of 170 miles. This satellite will be used chiefly to study the atmosphere and ionosphere -- for example, the unexplored regions about the poles.

NASA also has well-advanced plans for exploring the moon. A lunar spacecraft -- known as Ranger -- has been designed to carry an instrument package built ruggedly enough to survive a crash landing on the moon. Then its instruments will record and radio back to earth data on the make-up of the lunar surface. We will begin test flights of Ranger this year, using the Atlas-Agena launch vehicle.

Following Ranger will come Surveyor, a spacecraft that will be able to make a so-called "soft landing" on the moon. More delicate scientific instruments than those in Ranger can thus be employed.

Also under way is a spacecraft that will fly close to Venus and Mars, and later perhaps other, more distant planets. This spacecraft, called Mariner, will carry instruments to measure planetary atmospheres, surface temperatures, rotation rates, magnetic fields, and surrounding radiation regions. The Mariner series will be launched by our Centaur vehicle.

The lunar and planetary explorations are not only for scientific investigations but also to initiate the technological developments that will lead to eventual manned flights throughout our solar system.

Manned Space Flight

Electronic instruments designed for NASA satellites and space probes can perform many intricate, ultra-swift, ultra-accurate tasks of sensing and measuring. However, the statistical data gathered and transmitted to earth by these instruments constitute only a part of the basic research necessary for understanding the larger realities of space. The most advanced apparatus can perform only as programmed. Instruments have no flexibility to meet unforeseen situations. Scientific data acquired in space by mechanical means must be balanced by on-the-spot human senses, human reasoning, and by the power of judgment compounded of these human elements. In this capacity lies man's superiority to the machines he invents and builds. And in that superiority lies the necessity for manned space flight, as soon as it is practicable. But before man can travel in space, the question of his ability to withstand the rigors of space flight -- radiation, weightlessness, high-g forces, and so forth -- must be answered. These are the reasons for the top national priority that has been assigned to Project Mercury.

As you know, NASA picked seven astronauts from among hundreds of men with excellent military test-pilot backgrounds, and has had them in rigorous mental and physical training for their job.

Each of these exceptional men specializes in some phase of the program. For instance, one has become expert in the recovery phase; another has concentrated on the capsule's life-support systems. And each man brings to his mission his own specialized experience and contributes it to the project. The astronauts have all had important things to say about the design of the capsule, its safety factors, etc., based upon their flight experience in aircraft.

The main capsule is now in the shakedown phase, having been modified in many ways during the research and development period. From the inception of Project Mercury, safety has been a primary concern, however, and the agency is determined that an astronaut will not be launched until the risk factor is at an absolute minimum.

NASA tentatively plans to launch the first manned, suborbital flight and the first manned orbital flight this year. Numerous qualification tests -- using unmanned capsules and capsules carrying specially trained chimpanzees -- will precede the manned flights.

The suborbital flight plan calls for a Redstone launch vehicle to fire the one-ton, bell-shaped Mercury capsule with an astronaut inside, on a 15-minute ballistic flight down the Atlantic Missile Range, Cape Canaveral, Florida, at speeds as high as 4,000 miles per hour. The capsule will reach an altitude of about 120 miles and a distance of 180 miles, landing in the sea off Florida.

Four weeks ago, on December 19, we had a completely successful unmanned initial flight of this character. The capsule was lifted from the ocean by helicopter 30 minutes after launch, and was on the deck of the aircraft carrier Valley Forge 15 minutes later.

In the orbital flight, an Atlas will launch the capsule from Cape Canaveral, injecting it into orbit over Bermuda. After three earth orbits at a speed of 18,000 miles per hour, the capsule will land in the Atlantic Ocean near the Bahama Islands about four and one-half hours after lift-off.

The Mercury Program is the start of our investigations with man in space. The Mercury capsule is small, has limited flight duration, and has essentially no maneuverability. Mercury is in itself useful as the initial phase of an ongoing program. Future manned spacecraft will carry crews of two or more astronauts, provide them some freedom to move about in a "shirt sleeve" environment, and assure sufficient flight duration and maneuverability for missions varying from earth orbiting to lunar orbiting and return. We now have industrial contracts for the study of this type of mission, which we call Apollo. The Apollo spacecraft will weigh 15,000 to 20,000 pounds and will require a launching vehicle designed especially for space missions.

Development of this launching vehicle, called Saturn, represents a major portion of NASA's effort. The first stage is designed, fabricated, and is undergoing static firing tests at the Marshall Space Flight Center, at Huntsville, Alabama. The cluster of eight engines will provide 1-1/2 million pounds of thrust for more than two minutes. Later this year, this experimental vehicle will be carried on a barge from Huntsville, on the Tennessee, Ohio, and Mississippi Rivers, to the Gulf of Mexico, and thence to the Atlantic Ocean and Cape Canaveral. Launchings will be made from two complexes being constructed at the north end of the Cape. The gantry towers for these complexes will rise more than 300 feet above the beach.

A three-stage Saturn will place the Apollo spacecraft in an earth orbit and, with the addition of a fourth stage, Apollo will be accelerated to a velocity sufficient for making a lunar inspection, but the available propulsion will not be adequate to effect a lunar landing. We are investigating advanced propulsion systems, both chemical and nuclear, which may lead to a single launching vehicle to carry explorers to the moon and back.

Another possible approach involves the use of Saturn vehicles, with assembly of a lunar landing vehicle in orbit by rendezvous techniques. We are conducting analytical studies and supporting technological development on these various possibilities. However, long before man first disembarks on the lunar surface, satellites will be used operationally in the everyday conduct of our business.

<u>Applications at Hand</u>

One of the most promising applications of satellites appears to be in the communications field. Capacities of international teleradio and cable systems are severely burdened today and will be exceeded by the demands of tomorrow. At present, television cannot be transmitted directly more than two or three hundred miles. However, the usable radio spectrum of frequencies above 20 mc. (whose range is limited to line-of-sight) offers almost unlimited bandwidth space. Ground-based microwave relay links and coaxial cables are employed to overcome the range limitation, but for overseas communications they are impractical, unreliable, or prohibitively expensive. Such prototypes as NASA's Project Echo have demonstrated conclusively that satellites can be used as communications relays or reflectors to extend line-of-sight transmissions to inter-continental ranges. Satellites can provide tremendous bandwidth capacity to meet the fast-growing need for teleradio communications. Their use will also permit rapid, voluminous transmission of scientific data to the electronic computers that are playing more and more significant roles in the workings of government, science, and industry.

NASA is developing meteorological satellites to provide worldwide observation of atmospheric elements -- the data meteorologists must have to understand atmospheric processes and to predict the weather. TIROS I, launched April 1, 1960, was the first step toward an operational meteorological satellite system. The highly successful 270-pound first TIROS satellite, orbiting at altitudes averaging 450 miles, transmitted 22,952 television pictures of the earth's cloud patterns.

This gave meteorologists unprecedented opportunity to relate the earth's cloud cover to weather observations from the ground. TIROS II was launched November 23, 1960, and is providing useful television pictures as well as infrared heat measurements of the earth.

The U. S. Weather Bureau and cooperating meteorological groups within the Department of Defense will be analyzing TIROS data for months to come. Already this data has made important contributions to meteorological research. For example, TIROS transmitted pictures of cyclonic storms whose spiral bands were more than 1,000 miles in diameter. The frequency and extent of highly organized cloud systems associated with these vortices were not fully realized before TIROS. Other pictures indicated the presence of jet streams, regions of moist and dry air, thunderstorms, fronts, and many other meteorological phenomena. It is clear that use of satellites of the TIROS type can greatly increase the accuracy of weather forecasting, particularly since they can report information from areas such as those over the oceans where it is difficult to obtain data by orthodox means.

OTHER BENEFITS

It goes without saying that space exploration holds genuine significance for the security and well-being of the United States. In addition, the space effort should benefit the entire economy. Needs of the space program spread across the whole industrial spectrum -- electronics, metals, fuels, ceramics, machinery, plastics, instruments, textiles, cryogenics, and many other areas.

A graphic example of participation in the space program can be seen from the development of the X-15. This experimental rocket craft, designed to fly to the fringes of earth's atmosphere, is the product of the efforts of some 400 different firms and contractors. At least 5,000 companies or research organizations are engaged in the space industry. More than 3,200 different space-related products have been required and are being produced. Industry supporting our space program will be providing technical developments leading to many new products.

One of the greatest demands of future spacecraft will be for new power sources. While rocket propulsion is basic, the power needed to operate space vehicles after launching may prove the larger and more important need. Progress has already been made by use of special kinds of batteries and solar cells which convert the sun's rays into electric current. These may eventually be replaced as greater power becomes necessary. One promising source is the fuel cell, which converts fuel directly into electric power without necessity for machinery or working parts. The fuel cell is simple, rugged, and efficient. Another method is power generated through the use of hot ionized gas (plasma). Gas acts as a conductor of electricity.

Part of the national space effort includes studies on how to use and re-use water during manned space flight. From research of this kind, knowledge may evolve which will prove very valuable in practical production of fresh water from other chemical compounds or mixtures, including seawater.

Space vehicles require electronic computers for determining the moment of launch, for fixing orbits, for navigation, and for processing collected data. Because of weight and size limitations, computers only a fraction of the size of present "electronic brains," are being developed. Miniaturization of equipment for U. S. spacecraft has made great progress. In fact, complete radios can be reduced to the size of a lump of sugar.

The glass industry has made substantial gains, as a result of space work. As one example, a highly heat-resistant ceramic developed for nose cones is being used in the manufacture of pots and pans.

Medical research is benefiting from space-developed devices and materials. Electronic equipment designed to measure low-level electrical signals is being adapted to measure body temperature and blood flow. Another example -- a derivative of hydrazine, developed as a liquid propellant for spacecraft, has been found useful in treating certain mental illnesses and tuberculosis.

Use of jet drilling for mining is another application adapted from space research. Jet drills are already working taconite ore in the Mesabi Range. Jet piercing can delve deeper into the earth than heretofore possible to find new sources of ore, coal, and oil. In stone quarrying, jet spalling and channeling are proven techniques. Rocket flame equipment allows cutting along natural cleavage planes or crystal boundaries -- hence slices stone thin without cracking and, in addition, produces a fine finish.

In the near future, when guidance devices permit controlled, soft landings, swift rocket transport of mail and other cargo may become feasible. Many other ways in which space technology may be put to use in the economy could be cited.

RECAPITULATION AND CONCLUSION

Less than three years after NASA began, we are already near the first pay-off stage. It seems certain that the next decade will see general use of weather and communications satellites and other outgrowths of present NASA research and development. Here, virtually assured, are early, practical, and extremely beneficial uses of space technology which should vastly improve services while effecting large savings.

Manned flight in space is close. NASA's Project Mercury, the first U. S. attempt toward this goal, will provide us with the acid test of the question: Can man survive and perform usefully in the space environment? I am optimistic. Animals have already survived brief space trips, apparently unharmed. Man's intelligence should permit him to adapt more successfully than animals to a new environment.

Is space friendly or hostile? You have seen that it is both. Space is a challenging frontier which man has just begun exploiting, but it is unapproachable except by careful and thorough exploration. The history of the human race could be written in terms of venturings into unknown and forbidding territories.

I am convinced that we shall be able to utilize space for the service of mankind. I believe that, in the long run, our ambitious adventures in space will repay us many times for all the work, funds, and daring that we can devote to it.

The question then arises, how fast shall be proceed? This is a question which you and your elected government representatives must answer. How do you feel we should deploy our country's resources, measured in terms of scientific and engineering manpower, remembering that there are other requiremeats for these resources than space investigation? What weight do you feel should be attached to the exploration of outer space? This is the basic question. You must provide the answer.

61-2

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

RELEASE NO. 61-3

FOR RELEASE: IMMEDIATELY
January 12, 1961

JOINT RELEASE WITH THE DEPARTMENT OF DEFENSE

AERONAUTICS AND ASTRONAUTICS COORDINATION BOARD ACTIONS OUTLINED

The Department of Defense and the National Aeronautics and Space Administration today summarized some of the actions initiated by the Aeronautics and Astronautics Coordination Board which was set up in September, 1960, to avoid duplication and achieve efficient use of the nation's space resources.

As a result of the Board's discussions, the responsibility for development and procurement of each major launch vehicle will be undertaken by a single agency only. Thus the Air Force has full responsibility for the procurement of the Agena-B and NASA for Centaur, regardless of whether the vehicles are used in the military or civilian space programs.

Other actions resulting from Board discussions are:

Assumption by NASA of the task of disseminating unclassified orbital information on satellites to the scientific community as a result of the transfer of operational control of the Air Force's Spacetrack facilities and the Navy's SPASUR (Satellite detection net) to North American Defense Command. (See DOD Press Release 1337-60, November 10, 1960).

Decision to launch initial Centaur development vehicles at an azimuth so that existing NASA tracking stations can be used. Upon completion of the ground network for the Defense Department's Project Advent communications satellite, which will use the Centaur vehicle, the azimuth will be altered to correspond to the new Advent network, perhaps as early as the fourth Centaur launch.

Decision for joint DOD (USAF) /NASA planning, funding and construction or modification of existing launch pads at the Atlantic Missile Range to provide pads for vehicles in the U. S. space programs using Atlas first stages.

As a result of a review of various joint DOD and NASA (or its predecessor, NACA) committees and liaison groups, seven have been disbanded and four were assigned to the various panels of the Board itself. In addition, the Board recognized the need to coordinate the bio-astronautic activities of DOD and NASA, and assignment of this responsibility was made to the Board's panel of Manned Space Flight.

The Aeronautics and Astronautics Coordinating Board is composed of management personnel of NASA, Office of the Secretary of Defense, Army, Navy and Air Force who, because of their official positions, have authority to carry out agreements and decisions reached as the result of discussions within the Board. Dr. Herbert F. York, Director of Defense Research and Engineering, and Dr. Hugh L. Dryden, Deputy Administrator of NASA, are co-chairmen.

In order to give specialized support to the Board in areas of mutual interest to NASA and DOD, six panels have been established with the chairman of each panel also serving as a Board member. NASA and DOD are represented on each panel. The panels and their chairmen are:

1. Manned Space Flight - Dr. Abe Silverstein, NASA
2. Unmanned Spacecraft - Dr. Homer E. Newell, NASA
3. Launch Vehicles - Dr. Courtland D. Perkins, Air Force
4. Space Flight Ground Environment - Lt. Gen. Donald N. Yates, USAF
5. Supporting Space Research and Technology - Mr. Ira H. Abbott, NASA
6. Aeronautics - Vice Adm. John T. Hayward, USN

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

RELEASE NO. 61-5

FOR RELEASE: Friday, p.m.
January 13, 1961

LIFE SCIENCES LABORATORY TO BE INSTALLED AT AMES

A Life Sciences Research Laboratory will be established at the National Aeronautics and Space Administration's Ames Research Center, Moffett Field, Calif., beginning February 1.

Dr. Clark T. Randt, Director of the NASA Office of Life Sciences Programs, said the installation at Ames Research Center will gradually grow to a staff of 60 scientific people and some 140 supporting technicians. The new facility will be opened with the assignment of Dr. Richard S. Young as Chief of the Environmental Biology Branch.

"We believe it is necessary for NASA to have such a facility to fulfill its legal responsibility of pursuing biomedical investigations in the space program," Dr. Randt said. "Our primary purpose in establishing a laboratory is to provide research facilities which will permit NASA to attract the kind of talent needed for leadership in the life sciences."

"It is not our intention to concentrate research in these laboratory facilities, but rather to augment, lead, direct, and encourage, and coordinate such research in other agencies of the government, the universities, and industry," Dr. Randt added.

The Ames location was chosen because it is close to several centers of outstanding research effort in the life sciences, including Stanford University and the University of California.

The Life Sciences Laboratory will be headed by a director who will serve as an assistant director to Dr. Smith J. DeFrance, who is now in charge of the Ames Research Center. Under the laboratory director will be three divisions -- Flight Medicine and Biology, Space Medical and Behavioral Sciences, and Space Biology.

The divisions are responsible for the following investigations:

Flight Medicine and Biology -- operational aspects of bio-medical experiments in flight and associated bio-technology,

Space Medical and Behavioral Sciences -- studies of the effects of environmental stresses through the disciplines of physiology, radiology and psychology,

Space Biology -- determination of space environmental effects upon simple living organisms at cellular and subcellular level, and ground based research and development pertaining to the search for extraterrestrial life.

Each division will contain several branches. The first branch to be established -- environmental biology -- will make basic biological investigations, prepare control experiments looking toward in-flight biological studies, and design test projects for flight.

Ames Research Center will provide administrative and some technical support for the new laboratory. The office of life sciences programs at NASA Headquarters will retain technical program direction. The Life Sciences group will initially occupy approximately 4,000 square feet of the laboratory and office space in an existing Ames structure, The Flight Research Building.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

RELEASE NO. 61-6

FOR RELEASE: January 17, 1961
Tuesday, 11 a.m.

FIRST NASA CONTRIBUTION AWARD

Dr. Frank T. McClure, chairman of the Research Center at The Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md., was presented an award of $3,000 today by T. Keith Glennan, NASA Administrator, for his invention of a Satellite Doppler Navigation System. This was the first award made under the invention award authority (Sec. 306) of the Space Act of 1958.

Dr. McClure's invention became the basis of the Navy Department's navigational satellite program, Project Transit.

When presenting the award to Dr. McClure, Dr. Glennan said, "This award is being made to you as an individual whose initiative and keen analytical insight were responsible for the undertaking of a development program that will have far-reaching benefits, the extent of which cannot yet be properly assessed."

Under the terms of the Space Act anyone is eligible for such an award if the contribution is used to further develop space and aeronautical activities of the United States. Applications are evaluated by the NASA Inventions and Contributions Board. Proposals which are considered by the board to be technically sound are brought to the attention of appropriate research and development groups for further study. The board may recommend that the Administrator make a monetary award for a contribution or invention which proves to be of "significant value in the conduct of aeronautical and space activities", under Sec. 306 of the Act.

Dr. McClure's contribution is the first to win an award. During the past six months approximately 750 applications have been received by the board. Members of the board established by the Administrator in December 1958 are Robert E. Littell, Chairman, Paul G. Dembling, Vice Chairman, Dr. James A. Hootman, Secretary, J. Allen Crocker, Elliott Mitchell, and C. Guy Ferguson. All are on the staff of NASA Headquarters.

The Transit system is based upon the ability to extract extremely accurate positional information from the measured Doppler shift of a satellite's transmitter during passage of the satellite over a tracking station or a ship's receiver. The Doppler shift is the measurement of the change of frequency of a radio signal transmitted from a satellite. This change, or shift, is caused by the satellite's motion relative to a receiving or tracking station. Dr. McClure recommended study of the Doppler shift as the basis of a new method of navigation. He said that if man could accurately calculate the location of an orbiting vehicle by its Doppler shift, then the reverse must be true, and the problem of locating the observing station by analysis of the Doppler signal could be even simpler and precision would more easily be obtained.

Dr. McClure joined the staff of the Applied Physics Laboratory in 1946 and was appointed to his present position three years later.

A native of Edmonton, Alberta, Canada, he was graduated from the University of Alberta in 1938 with a Bachelor of Science in organic chemistry. Dr. McClure received his Doctor of Philosophy from the University of Wisconsin in 1942. After post graduate studies he was on the faculty of the University of Rochester before coming to Washington, D. C. to join the research staff of the George Washington University, then engaged in research and development on rockets under the National Defense Research Council of the Office of Scientific Research and Development. During World War II he served as a scientific consultant to the armed forces in the field of rocket propulsion and was awarded the Presidential Certificate of Merit by President Truman for this work.

Dr. McClure is married to the former Mary Soffa of Preston, Minn. They have two sons, Charles F., a junior at The Johns Hopkins University and Michael D., a high school sophomore. The McClures live at 810 Copley Lane, Silver Spring, Maryland.

- END -

Cun

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: TUESDAY, A.M.
January 24, 1961

RELEASE NO. 61-7

OCTOBER CONTRACTS LISTED

The National Aeronautics and Space Administration awarded the following new contracts and research grants during October 1960:

NASA HEADQUARTERS
Washington, D. C.

University of California (Berkley, Calif.) -- $140,801 -- Initiate studies on inert gases in meteorites, x-ray diffraction, and gamma ray detection techniques for lunar exploration.

University of California (Berkley, Calif.) -- $175,362 -- Research on cosmogenic radioactivity of meteorites, cosmic abundances of the elements and structure and composition of meteoritic specimens. Study is expected to improve understanding of processes taking place in interplanetary space and atmospheres of planets.

Florida State University (Tallahassee, Fla.) -- $103,804 -- Research on chemical mechanisms by which life might have begun. Investigation will include study of organic chemistry of environments and range of enviromental conditions resembling those which may have nourished original life.

Harvard University (Cambridge, Mass.) -- $200,000 -- Design, development and construction of instrumentation for observation of solar radiation from satellites. Research contract will include preparation of a laboratory model and two flight test models. Preliminary design studies will also be made of instrumentation for an Orbiting Astronomical Observatory.

Thermionic Products Company (Plainfield, N.J.) -- $41,768 -- Study to improve the quality of refractory metal sheet looking toward particular improvements in ductility and welding characteristics over presently available sheet. Fabrication properties of molybdenum and molybdenum alloy strip will be studied.

U. S. Department of Commerce, National Bureau of Standards (Washington, D. C.) -- $70,000 -- Investigation of the mechanism of transition from laminar to turbulent flow in boundary layers in both subsonic and supersonic flows.

U.S. Department of Commerce, National Bureau of Standards (Washington, D.C.) -- $35,000 -- Conduct research on the mechanisms and kinetics of degradation of polymers by ultraviolet radiant energy. The study will include consideration of the relationships between chemical structure and radiation stability. Information obtained should result in knowledge pertinent to the synthesis of materials for use in space environments.

U.S. Department of Commerce, National Bureau of Standards (Washington, D.C.) -- $50,000 -- Conduct experimental research on thermionic materials, including selection of materials, construction of apparatus, and preliminary measurements of vaporization and thermionic emission.

United Research, Inc. (Cambridge, Mass.) -- $25,447 -- Study of the regulatory aspects of the commercial application of communications satellites.

University of Minnesota (Minneapolis, Minn.) -- $105,000 -- Conduct high altitude balloon flights with an instrument package for cosmic rays and solar-terrestrial phenomena. These flights, together with ground observations during period of high solar activity, are expected to prove valuable in clarifying solar-terrestrial interactions.

GODDARD SPACE FLIGHT CENTER
Greenbelt, Md.

Air Research and Development Command (Andrews AFB, Washington, D.C.) -- $53,000 -- Provide for supply of liquid hydrogen to AEC in connection with KIWI reactor system components development in support of Project Rover.

Army Ordnance Missile Command (Redstone Arsenal, Ala.) -- $42,314 -- Procurement of six rocket motors for Argo D4 research rockets.

American Science and Engineering, Inc. (Cambridge, Mass.) -- $97,000 -- Design, construction and testing of one prototype X-ray telescope for Orbiting Solar Observatory.

Cornell Aeronautical Laboratory, Inc. of Cornell University (Buffalo, N.Y.) -- $232,162 -- Study of the Equilibrium and non-equilibrium flow of high temperature hydrogen through jet nozzles.

Electro-Mechanical Research Inc. (Washington, D.C.) -- $31,870 -- Furnish a monitor console and related items as part of telemetry reduction system for Flight Control and Operations Building.

Motorola, Inc. (Scottsdale, Ariz.) -- $44,814 -- Eleven command receivers for Aerobee research rockets.

Thiokol Chemical Corp. (Elkton, Md.) -- $29,149 -- 20 Cajun rocket motors.

Yale University (New Haven, Conn.) -- $48,000 - Study to improve methods of calculating orbits of artificial satellites. Analytical work will be done in celestial mechanics and physics necessary to improve the equation from which motions of satellites are computed.

AMES RESEARCH CENTER
Mountain View, Calif.

Poly Industries, Inc. (Pacoima, Calif.) -- $41,412 -- Manufacture of thirty-six propeller blades for use in 12-ft. Pressure Wind Tunnel.

LEWIS RESEARCH CENTER
Cleveland, Ohio

Bausch & Lomb, Inc. (Rochester, N.Y.) -- $43,373 -- Furnish a remote control metalograph and remote control stereomicroscope for the examination of radio-active material at Plum Brook.

Fischback & Moore, Inc., Instrumentation Division (Dallas, Texas) -- $26,840 -- Process systems instrumentation for facilities at Plum Brook.

Hamilton-Electrona, Inc. (New York, N.Y.) -- $70,000 -- Hi-voltage electron beam welding machine.

Lockheed Aircraft Corporation, Lockheed Nuclear Products (Marietta, Ga.) -- $404,002 -- Furnish a low-powered nuclear reactor at Plum Brook facility, Sandusky, Ohio. Reactor will be used to check out feasibility of proposed experiments.

Manson Laboratories, Inc. (Stamford, Conn.) -- $188,790 -- High voltage power supply for ion jet engines in Ion and Plasma Jet Facility.

LANGLEY RESEARCH CENTER
Hampton, Virginia

Allied Chemical Corp. (Hopewell, Va.) -- $25,500 -- Supply cyanogen gas used in plasma research at Langley.

B. & H. Manufacturing Co., Inc. (Bethesda, Md.) -- $41,470 -- Furnish VGH (velocity, acceleration, altitude) recorders, transmitters and film drums. Recorders will be used to obtain time-history records of operating conditions pertinent to gust loads on airplanes.

Compudyne Corp. (Hatboro, Pa.) -- $372,216 -- Design, furnish, fabricate and install an integrated group of four automatic control systems for High-temperature Structural Dynamics facility.

J. E. Greiner Co. (Baltimore, Md.) -- $56,000 -- Architect/ engineer services for Dynamic Research Laboratory.

National Light Metals & Plastic Co. (Caro, Mich.) -- $26,408 -- Manufacture, assembly, load testing, measuring and delivery of twenty-eight Fin Assemblies for use on Nike booster rocket motor and Pilotless Aircraft component parts.

Santaniello Brothers (Newark, N.J.) -- $37,475 -- Extension of electrical distribution systems for Wallops Island facility.

MARSHALL SPACE FLIGHT CENTER
Huntsville, Ala.

Aberdeen Proving Ground (Aberdeen, Md.) -- $37,200 - Provide wind tunnel tests for Saturn force tests.

Acousti Engineering of Alabama (Birmingham, Ala.) -- $78,424 -- Furnish and install movable metal office partitions.

Acoustica Associates Inc. (Los Angeles, Calif.) -- $74,200 -- Furnish labor, materials, tooling and facilities to produce LOX and fuel sequence sensors for Saturn.

Ampex Data Products Co. (Atlanta, Ga.) -- $54,270 -- Provide magnetic tape system and reproducers for Saturn.

Ampex Data Products Co. (Atlanta, Ga.) -- $25,750 -- Tape recording and reproducing system for Saturn.

ARDC (Washington, D.C.) -- $350,000 -- Provide propellant for Saturn engine.

Commanding General, U.S. AOMC (Redstone Arsenal, Ala.) -- $40,000 -- Perform a research and development program of spectrographic analysis of the exhaust products of a spectroscopically clean plasma arc jet.

Electronic Associates Inc. (Long Branch, N.J.) -- $174,460 -- Analog computing system.

Fenwal Inc. (Ashland, Mass.) -- $25,738 -- Calorimeters and thermocouples for temperature measurements in Saturn.

Flexonics Corp. (Maywood, Ill.) -- $55,342 -- Qualification and test work on fuel, vent and pressurization lines for Saturn.

Frebank Co. (Glendale, Calif.) -- $77,621 -- Design and manufacture of Saturn thrust, hydraullic, fuel tank, and LOX tank pressure switches.

Hayes Corp., Hayes Construction Division (Birmingham, Ala.) -- $1,087,692 -- Testing, checkout and related services for Saturn launch facility at Cape Canaveral, Florida.

H. L. Eskew & Sons (Birmingham, Ala.) -- $92,652 -- Administrative building modifications.

International Data Systems Inc. (Dallas, Texas) -- $69,540 -- Five multiplexers for Saturn.

Jaco Wholesalers, Inc. (Huntsville, Ala.) -- $30,783 -- Furnish miscellaneous lighting fixtures.

Midwest Research Institute (Kansas City, Mo.) -- $40,047 -- Theoretical research on loading of missiles due to atmospheric turbulence and wind shear.

Ortholog Division, Gulton Industries (Trenton, N.J.) -- $26,820 -- Furnish a transfer function analyzer.

Pearce and Gresham Co. (Decatur, Ala.) -- $55,616 -- Administrative building modifications.

Pearce & Gresham Co. (Decatur, Ala.) -- $56,355 -- Modifications to liquid hydrogen facilities at Test Cell "C" at Marshall.

The Martin Company (Baltimore, Md.) -- $114,814 -- Study of operational requirements of Saturn C-2 system.

Smithsonian Institution (Washington, D.C.) -- $50,000 -- Performance by the Smithsonian Astrophysical Observatory of a program of research on the motion of an artificial satellite around its center of mass.

Sperry Farragut Co., Division of Sperry Rand Corp. (Bristol, Tenn) -- $234,993 -- Engineering and fabrication services for testing, evaluation, refinement, re-work, and/or manufacturing of various guidance, control and instrumentation systems and components for Saturn.

Texas Instruments Inc. (Dallas, Texas) -- Furnish 150 amplifiers for Saturn.

Thompson Ramo Wooldridge, Inc. (Canoga Park, Calif.) -- $96,432 -- Research and development of porous tungsten ion emitters for use in electrostatic propulsion.

Thompson Ramo Wooldridge, Inc. (Cleveland, Ohio) -- $86,432 -- Research and development of arc ion sources for electronic propulsion.

U.S. Army Engineer Mobile District, Corps of Engineers (Mobile, Ala.) --- $600,000 -- To provide for the construction of a pressure test cell.

U.S. Department of Commerce, National Bureau of Standards (Washington, D. C.) -- $43,000 -- To investigate the total and spectral emissivities of materials at very high temperatures.

U.S. Army Engineer Mobile District, Corps of Engineers (Mobile, Ala.) -- $2,400,000 -- To provide for the construction of the extension to the assembly building.

Van Keuren, Davis and Co. (Birmingham, Ala.) -- $43,500 -- Architectural and engineering services for Building 4610 at Marshall.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: 4:00 P.M.
February 2, 1961

Release No. 61-8

JOINT RELEASE WITH THE ATOMIC ENERGY COMMISSION

AEC-NASA INVITE PROPOSALS FOR RESEARCH AND DEVELOPMENT OF NUCLEAR ROCKET ENGINE

The Atomic Energy Commission-National Aeronautics and Space Administration Nuclear Propulsion Office today invited proposals for research and development of a nuclear rocket engine.

This selection, although based on a company's capability to carry out the entire nuclear engine development program, will result initially in a contract for the first phase only. This phase will include assistance to the Los Alamos Scientific Laboratory in the conduct of the KIWI B test program, and performance of certain research and development tasks on non-nuclear components.

Plans for such an invitation were announced by the Atomic Energy Commission and the National Aeronautics and Space Administration on November 1, 1960.

The nuclear rocket propulsion program is a joint responsibility of the AEC and NASA and is managed by the joint AEC-NASA Nuclear Propulsion Office, established on August 31, 1960.

Experiments completed to date include three nuclear reactors. The last experiment, KIWI A 3, was successfully ground-tested by its designer, the Los Alamos Scientific Laboratory, at the Nevada Test Site on October 19, 1960. This reactor used high pressure hydrogen gas for its propellant.

Further detailed information on the engine proposal invitation may be obtained from the Contracting Officer, AEC-NASA Nuclear Propulsion Office, care of National Aeronautics and Space Administration, Washington 25, D. C.

The proposals must be received by the AEC-NASA Nuclear Propulsion Office not later than 10 A.M. EST, April [illegible]3, 1961.

- end -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: IMMEDIATE
January 23, 1961

Release No. 61-9

NASA AWARDS CONTRACT FOR STUDY OF ION ROCKET USES

The United Aircraft Corporation's Research Laboratories of East Hartford, Conn., was chosen for negotiation of a $100,000 ion rocket study contract today by NASA.

The Connecticut firm proposes a 12-month study, using realistic thrust, power supply and weight data to determine the possible payloads, trajectories, and engine operating times for various specific deep space missions. The study will include the optimum calendar times for launching the missions.

Also to be studied under this contract is a dual thrust propulsion system. An analysis will be made of this engine combination of ion and chemical power during flight time for various missions.

The earliest class of ion rockets considered for space flights will have one-tenth of a pound thrust, and will be powered by 30 kilowatt Snap-8 nuclear reactors, after having been lifted beyond the earth's gravitational field by Atlas-Centaur or Saturn C-1 boosters. While an ion rocket's low thrust makes it a feasible source of propulsion only in the vacuum of deep space, its low fuel consumption and high specific impulse makes it possible to propel heavy payloads on long space trips.

Examples of typical missions for which the use of ion rockets will be studied include: A close orbit around Mars; a close orbit around Venus; a Jupiter satellite, a probe to fly by Mercury and return, and a probe launched out of ecliptic plane.

The study will also consider ion engine of higher power ratings up to one megawatt. Data gained from the latter phase will guide development of future ion engines.

- end -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON 25, D. C.

Release No. 61-010

FOR RELEASE: IMMEDIATELY
Jan. 19, 1961

NASA SUSPENDS PROGRAMMING OF TIROS II WIDE ANGLE CAMERA

NASA today announced an indefinite suspension of the programming of wide angle photographs from TIROS II, an experimental weather observation satellite launched on November 23, 1960.

This action was taken as a result of a malfunction causing unprogrammed effects in the timing clock operation and the wide angle camera system which if allowed to continue might possibly disable the satellite completely through a total power drainage.

Programming of remote narrow angle photographs also has been suspended temporarily pending a study of the causes of a different erratic behavior in that system. It is expected that remote narrow angle photographs will be resumed following an analysis of this camera system.

The first indication of the malfunction of the wide angle camera was observed on January 11 as the satellite completed 728 orbits. The satellite resumed normal operation until January 16 when the unprogrammed operation was again observed.

Direct read-outs of photographs from both cameras and the infrared experiments have been unaffected by the malfunction and it was the threat of danger to these experiments through power failure that prompted the decision on Jan. 18 to suspend the remote wide angle camera operation.

As of January 8, 1961, the wide angle camera had taken 9,524 photographs which could be usefully interpreted for current practical weather analysis. A total of 11,102 photographs had been taken by the wide angle camera, so that on a percentage basis approximately 86 per cent of the photographs have been useful; this in spite of the fact they are not of the same quality as those transmitted by TIROS I.

The narrow angle camera also functioned excellently, having transmitted a total of 894 photographs of which 545 have been classified useful. Power constraints which limit the simultaneous use of the cameras and the fact that wide angle camera pictures are useful by themselves while narrow angle pictures usually need concurrent wide angle pictures for useful interpretation account for the greater number of wide angle photographs being programmed.

A detailed synoptic analysis has not been possible due to a defocusing of the wide angle camera lens and the twenty-one foreign nations who had been invited to participate in the TIROS II program were so advised soon after launch. Orbital information and photographs from their areas were offered to those nations which still desired to carry out some limited experiments.

Eight nations responded and have been given this material. These eight nations have now been notified of the suspension of future wide angle photographs.

A similar cooperative program is planned in connection with the launching of TIROS III sometime during 1961.

The experiment to partially control the orientation of the satellite spin axis has been highly successful. The operation of a simple magnetic system permits ground observers to slowly change the angle of the satellite's axis in space. This is a first in space experiments.

This magnetic orientation system, developed by engineers of the Radio Corporation of America's Astro-Electronics Division in cooperation with National Aeronautics and Space Administration scientists, has been activated a number of times since launching in order to obtain a more advantageous angle of view for the infrared and television equipment in the satellite or to gain maximum power from the solar cells which cover its top and sides.

Such data from the infrared experiments as have been analyzed to date indicate these experiments are proving to be generally successful. The collection of the infrared data will be a continuing process throughout the useful life of the satellite.

The TIROS II satellite is an experiment with an estimated useful lifetime of only about three months and cannot be considered an operational weather system. However, the wide angle cloud pictures are being used for a limited, experimental current weather analyses by the U. S. Weather Bureau and the military weather services.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: IMMEDIATELY
Jan. 19, 1961

Release No. 61-010

NASA SUSPENDS PROGRAMMING OF TIROS II WIDE ANGLE CAMERA

NASA today announced an indefinite suspension of the programming of wide angle photographs from TIROS II, an experimental weather observation satellite launched on November 23, 1960.

This action was taken as a result of a malfunction causing unprogrammed effects in the timing clock operation and the wide angle camera system which if allowed to continue might possibly disable the satellite completely through a total power drainage.

Programming of remote narrow angle photographs also has been suspended temporarily pending a study of the causes of a different erratic behavior in that system. It is expected that remote narrow angle photographs will be resumed following an analysis of this camera system.

The first indication of the malfunction of the wide angle camera was observed on January 11 as the satellite completed 728 orbits. The satellite resumed normal operation until January 16 when the unprogrammed operation was again observed.

Direct read-outs of photographs from both cameras and the infrared experiments have been unaffected by the malfunction and it was the threat of danger to these experiments through power failure that prompted the decision on Jan. 18 to suspend the remote wide angle camera operation.

As of January 8, 1961, the wide angle camera had taken 9,524 photographs which could be usefully interpreted for current practical weather analysis. A total of 11,102 photographs had been taken by the wide angle camera, so that on a percentage basis approximately 86 per cent of the photographs have been useful; this in spite of the fact they are not of the same quality as those transmitted by TIROS I.

The narrow angle camera also functioned excellently, having transmitted a total of 894 photographs of which 545 have been classified useful. Power constraints which limit the simultaneous use of the cameras and the fact that wide angle camera pictures are useful by themselves while narrow angle pictures usually need concurrent wide angle pictures for useful interpretation account for the greater number of wide angle photographs being programmed.

A detailed synoptic analysis has not been possible due to a defocusing of the wide angle camera lens and the twenty-one foreign nations who had been invited to participate in the TIROS II program were so advised soon after launch. Orbital information and photographs from their areas were offered to those nations which still desired to carry out some limited experiments.

Eight nations responded and have been given this material. These eight nations have now been notified of the suspension of future wide angle photographs.

A similar cooperative program is planned in connection with the launching of TIROS III sometime during 1961.

The experiment to partially control the orientation of the satellite spin axis has been highly successful. The operation of a simple magnetic system permits ground observers to slowly change the angle of the satellite's axis in space. This is a first in space experiments.

This magnetic orientation system, developed by engineers of the Radio Corporation of America's Astro-Electronics Division in cooperation with National Aeronautics and Space Administration scientists, has been activated a number of times since launching in order to obtain a more advantageous angle of view for the infrared and television equipment in the satellite or to gain maximum power from the solar cells which cover its top and sides.

Such data from the infrared experiments as have been analyzed to date indicate these experiments are proving to be generally successful. The collection of the infrared data will be a continuing process throughout the useful life of the satellite.

The TIROS II satellite is an experiment with an estimated useful lifetime of only about three months and cannot be considered an operational weather system. However, the wide angle cloud pictures are being used for a limited, experimental current weather analyses by the U. S. Weather Bureau and the military weather services.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Thursday, 6:00 p.m., EST
January 19, 1961

RELEASE NO. 61-11

SURVEYOR CONTRACT NEGOTIATIONS BEGIN

The National Aeronautics and Space Administration today selected Hughes Aircraft Co. for contract negotiations on plans to build a soft-landing lunar spacecraft called Surveyor.

The spacecraft will be designed to land gently on the moon, perform chemical analyses of the lunar surface and subsurface and relay back to Earth television pictures of lunar features.

Plans call for seven Surveyors to be launched to the moon in the period of 1963-66. The California Institute of Technology's Jet Propulsion Laboratory -- NASA's center for lunar and planetary exploration -- will provide technical direction for the program, which is expected to cost upwards of $50 million.

Surveyor will soft-land 750 pounds on the lunar surface. The landing will be accomplished by a solid propellant retro-rocket which will fire in a direction opposite to the flight of the spacecraft to slow it down to about 10 miles an hour. This is slightly slower than a manned parachute landing on Earth.

Of the 750 pounds landed on the moon, over 200 pounds will be instruments.

The spacecraft will land on three legs. Standing on this tripod, the spacecraft will be approximately 11 feet high, including the directional antenna on top.

Surveyor is a follow-on program to NASA's Ranger series, which will rough-land small instrument packages containing seismometers on the moon in the next few years. Where the Ranger instrument packages will rough land at something under 300 miles an hour, Surveyor will land at between 5 and 10 miles an hour.

All seven Surveyors will be launched by the Atlas-Centaur system from Cape Canaveral, Fla. Flight time from launch pad to lunar landing will be on the order of 66 hours.

Surveyor will weight approximately 2500 pounds when it is injected on its lunar trajectory by the Atlas-Centaur. When it lands on the moon, after the retro-rocket has fired, it will weigh 750 pounds, of which 500 pounds will be communications equipment, structure and temperature control instrumentation to protect it from the heat of the lunar day and the cold of the lunar night.

The remaining 250 pounds will be scientific instruments, including several television cameras, a sensitive seismometer to record moon quakes or meteoritic impacts, a sensitive magnetometer to determine if the moon has a magnetic field, instruments to measure the gravity of the moon, a drill, instruments to analyze the composition of the moon's surface and subsurface, and instrumentation to measure radiation and the lunar atmosphere.

The drill will be extended from Surveyor and will be designed to penetrate at least 18 inches into the lunar surface. As it drills, small fragments of the moon's surface and subsurface will be brought into the spacecraft where instrumentation will perform chemical analyses. One of the multiple TV cameras will be used to monitor this operation so that scientists at JPL's Goldstone Tracking Station can watch on their TV screen the performance of the semi-automated system.

Walker E. Giverson is JPL's Surveyor program manager under the direction of Clifford I. Cummings, JPL lunar program director.

The Hughes company of Culver City, Calif., was one of four companies which prepared design studies in the final competition.

# # #

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: HOLD FOR LAUNCH

RELEASE NO. 61-12

AEROBEE PROBE TO STUDY LIQUID HYDROGEN

The Lewis Research Center in cooperation with the Langley and Goddard Research Centers of the National Aeronautics and Space Administration plans to launch from Wallops Island the first of a series of experiments designed to study the behavior of liquid hydrogen under the zero gravity environment. The series applies to launch vehicles which NASA contemplates using on difficult missions of the future. Both the Centaur and Saturn vehicles will use liquid hydrogen. This liquid is also expected to propel the nuclear-powered rockets of the Rover project.

Liquid hydrogen has a density about one-tenth that of kerosene or other hydrocarbon fuels. It has a boiling point of minus 423 degrees Fahrenheit at sea level. Its behavior in a zero gravity field will be discovered in this series of experiments from Wallops, all of which will be spaceborne by relatively low-cost sounding rockets.

According to Lewis engineers this launch includes a 250-pound payload consisting of a partially filled liquid hydrogen dewar and recovery package.

The dewar is instrumented to determine the heat transfer coefficients for liquid hydrogen in the absence of gravity. A spin-stabilized platform holds the dewar bottle which in flight will be photographed by a recoverable film package.

The vehicle will leave its pad position in a near vertical trajectory and is expected to attain a velocity of 5600 feet per second. The desired peak altitude is 118 statute miles. The trajectory will provide a gravity free period of about 5.1 minutes.

Tilting of the launch tower sets the trajectory and will cause the rocket to impact near the center line of the safe factor designated by the Wallops Island safety officer. A range of more than 40 miles is desirable for successful recovery.

All scientific data other than photographic will be telemetered to ground recording stations.

During the flight period of zero gravity it is essential that the liquid hydrogen is in a motionless state. To avoid deceleration which would cause the liquid hydrogen to move to the top of the dewar, residual rocket pressurization gas will be plumbed to two nozzles which will draw gas from an oxidizer tank.

Propellant shut-off valves will be installed in both fuel and oxidizer feed lines. These valves can be closed by radio command to effect emergency propulsion cut-off in the event of erratic rocket performance.

The Aerobee 150-A sounding rocket is manufactured by the Aerojet-General Corporation.

Recovery will be by helicopter supplied by the All American Engineering Corporation.

The recovery system was supplied by the Cooper Development Division of the Marquardt Corporation. It is housed in the forward section of the nose-cone and includes experiment camera, parachute, radar chaff, Sarah beacon, flotation bag, and dye marker. The package will be separated through pyrotechnic charges at 380 seconds by timer command. Following separation, the package will free-fall to approximately 30,000 feet when the parachute will be ejected.

- end -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

RELEASE NO. 61-13

FOR RELEASE: Immediately
January 24, 1961

INDUSTRY BRIEFING ON PROJECT RELAY

Specifications for a low altitude active communication satellite, Project Relay, were outlined to representatives of 41 industries by the National Aeronautics and Space Administration today at its Goddard Space Flight Center, Greenbelt, Maryland.

Relay is NASA's first active communications satellite research and development project. Purposes are to demonstrate the feasibility of basic concepts and technological approaches and to evaluate the various systems to be employed in communications satellites.

First launch of an 85-lb. Relay satellite with a Delta launch vehicle from Cape Canaveral will be about mid-1962. Wideband communications signals covering the range of television signals, multi-channel telegraphy and data handling will be transmitted between the east coast of the United States and western Europe. The payload will carry instruments to detect radiation damage and other environmental effects on critical components such as solar cells as it passes through the Van Allen radiation Belts. The programmed elliptical orbit will have apogees of about 2,800 to 3,400 statute miles and perigees of about 650 to 1,600 statute miles during a period of approximately 180 minutes.

Prospective bidders were requested to submit proposals to officials at the Goddard Space Flight Center by March 6, 1961.

- END -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RELEASE NO. 61-14-1 WASHINGTON 25, D.C. FOR RELEASE: Saturday AM's
January 28, 1961

PROJECT MERCURY BACKGROUND

In a week or so -- barring unforeseen but not completely unexpected trouble -- a Mercury spacecraft carrying a chimpanzee will be launched from Cape Canaveral, Fla.

Why?

Because information from this test will make one more link in a concurrent chain of tests which one day will decide how soon a United States astronaut orbits the Earth.

The key word here is concurrent.

Concurrency is a fiber running throughout Project Mercury. Concurrency means research and development with scores of engineering studies and tests all performed within the same time span but at different sites....

Concurrency means hardware flight tests on three different boosters -- Atlas, Redstone and Little Joe -- at two launch sites, Cape Canaveral and Wallops Station, Va.

In the same breath, concurrency means thousands of ground tests.... crew training exercises....and the like at facilities across the nation and at Mercury tracking stations around the world.

Why all the concurrency? What's the rush?

Stripped of all the scientific qualifiers, the answer is this: Mercury will prove how well man can survive, and whether he can think clearly and perform useful functions in the unknown weightless void of space. Such proof -- negative or positive -- will have a tremendous impact on space vehicle design and space exploration planning for decades to come. The sooner we get the proof, the better off we will be. With luck, we may have a man in orbit within a year.

The concurrent approach, which requires the ultimate in planning and coordination, adds up to the fastest and at the same time the most thorough way of getting the job done.

The project is a big one. And it's a costly one, too. Current estimates put the total job at nearly $400 million. Phases of the work are going on at a 24-hour-a-day, seven-day-a-week clip. But the payoff will be just as impressive.

Before the United States attempts its first manned orbital step into space aboard an Atlas, every Mercury spacecraft system -- including several astronauts at least -- will have been space-qualified on at least one of Mercury's boosters.

Each flight test in any given Mercury series -- Atlas, Little Joe or Redstone -- presents new technical hurdles, introduces new systems, seeks new or additional information. A comparison of the first successful Mercury-Redstone flight on Dec. 19, 1960, and the upcoming Mercury-Redstone test point up launch-to-launch differences dramatically.

For example, in a highly successful overall test, MR-1 climbed as programmed to about 130 miles and landed some 235 miles down range. The upcoming MR-2 program shaves the peak altitude to 115 miles and extends the landing point to about 290 miles.

Why the change?

For one reason, high altitude winds carried the MR-1 flight quite close to range safety limits which dictate that a missile will get out and away from the Cape area as quickly as possible. The somewhat lower, flatter MR-2 trajectory will avoid that. Also the MR-2 lob will reduce the re-entry G (gravity forces) to about 11 instead of the 12-plus re-entry G encountered in the steeper up-and-down MR-1 profile.

Another difference is MR-2 will have a passenger -- a chimpanzee weighing about 40 pounds -- whereas MR-1 did not. This means the first flight test of the all-important life-support system. For details on the chimpanzee, see the Animal Flight Program fact sheet enclosed.

Still another difference is the fact that for the first time a system capable of sensing impending booster trouble and separating capsule from booster will be operated on a fully automatic, self-contained basis. This all-important bond between booster and space-craft is something not found in any other space program.

Such differences are fairly well documented at each launch. All but forgotten in the jarring noise and blast and excitement of a launch, however, are the weeks and months of component and system testing that go into any given spacecraft.

That story cannot be found at Cape Canaveral. It unfolds in labs at St. Louis....Minneapolis....Langley....San Diego....Huntsville....Los Angeles. The story goes something like this:

Pick a component. Test it. Then test it to destruction. Note exactly when, where and why it fails. Then wire it to another component. And so on. Finally a system is assembled. How does it work as a system? Operate it in a jarring shake-test. Then run it under perhaps twice the heating it will have to take in flight. Run it in subfreezing temperatures. And the tests go on.

After it is checked out, it goes to McDonnell Aircraft, prime spacecraft contractor for the Mercury spacecraft. Now it must go through similar tests but in fine-mesh sequence with other systems, added and tested one system at a time. Final assembly is done in a "white" room under hospital-sterile conditions.

At the Cape the capsule goes through another punishing round of hangar and pad checkouts before it is pronounced ready for flight.

When it is ready, more than seven miles of wire will interlace a dozen or more major systems and sub-systems made up of more than 10,000 components. All this is shaped and stacked layer on layer in a capsule providing less total volume than that of a standard telephone booth. Space and weight are at a premium.

The maze of circuitry feeding off primary and auxiliary power sources presents special electronic problems. Mercury engineers call them "glitches."

A "glitch" is a minute change in voltage on a line which is enough to trigger a hair-spring sensitive system feeding off the same line. Say an electrical command has energized a certain line for several seconds. When the signal fades, the change in voltage sometimes can be enough to trigger another system out of proper sequence.

These kinds of "bugs" are the most difficult to get rid of. Making it all the more difficult in the Mercury spacecraft is an accessibility problem.

Engineering records show that it may take several hours to get to a faulty component which might take only 10 to 15 minutes to fix or replace. Several layers of fixtures and wiring might have to be removed to get to the sour part. Space is limited!

To date, Mercury has rolled up a significant flight test record. In addition to hundreds of wind-tunnel and air drop tests, the following rocket-boosted Mercury test flights of research and development models have provided a wealth of information:

Big Joe -- September 9, 1959 -- From the Atlantic Missile Range, to test the structural integrity and heating of a research model of the Mercury spacecraft boosted by an Atlas.

Little Joe I -- October 4, 1959 -- From NASA's Wallops Station, Va., to test integration of booster and spacecraft, utilizing a 250,000-pound thrust booster vehicle consisting of eight solid rockets.

Little Joe II -- November 4, 1959 -- From Wallops Station, to evaluate critical low-altitude abort conditions.

Little Joe III - December 4, 1959 -- From Wallops Station, to check performance of the escape system at high altitude. Rhesus monkey Sam was aboard.

Little Joe IV -- January 21, 1960 -- From Wallops Station, to check escape system under high airloads. Rhesus monkey Miss Sam was aboard.

In addition, four production versions, built by McDonnell Aircraft Company, have been test flown.

May 9, 1960, a McDonnell-built spacecraft underwent a test of its escape system in an off-the-pad abort situation. This test was conducted at Wallops Station and only the craft and its escape rocket system were used.

July 29, 1960, a Mercury spacecraft test flight was conducted at Cape Canaveral, Florida, utilizing an Atlas booster. The purpose of the test was to qualify the spacecraft under maximum airloads and afterbody heating during reentry. A system malfunction prevented attainment of flight objectives. The test will be repeated.

November 7, 1960, Little Joe V from Wallops Station, to qualify production hardware in an abort under most severe launch conditions anticipated during an Atlas-boosted launch. A system malfunction prevented attainment of flight objectives. This test also will be repeated.

December 19, 1960, A Mercury-Redstone combination was successfully flight-tested from Cape Canaveral, Florida. All test objectives were achieved.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington 25, D. C.

Chron

STATEMENTS TO THE PRESS
Tuesday
January 31, 1961

3:45 p.m., EST

Cape Canaveral, Fla. -- The Project Mercury spacecraft launched at 11:55 a.m., EST, here today has been recovered. The hatch of the spacecraft has not yet been opened, and so there is no additional information available at this time on the condition of the chimpanzee. The spacecraft was placed on the deck of the U.S.S. Donner (LSD) at 3:41 p.m., EST.

* * *

3:50 p.m., EST

Cape Canaveral, Fla. -- The chimpanzee is alive and apparently in good condition.

* * *

3:52 p.m., EST

Cape Canaveral, Fla. -- Animal Subject 65 was known to his handlers at Aeromedical Field Laboratory, Holloman Air Force Base, N. M., as "Ham."

* * *

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

JAN 31 1961

ANNEX II, Item 1

Mercury Spacecraft Launched

Cape Canaveral, Florida. - Project Mercury spacecraft, carrying a chimpanzee, was launched in a suborbital ballistic trajectory at 11:55 am EST here today.

The test, conducted by the National Aeronautics and Space Administration, is the second designed to qualify a production version of the spacecraft in the environment of space utilizing a Redstone as the launch vehicle.

The chimpanzee is included in today's test to qualify the spacecraft's environmental control system and aeromedical instrumentation.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C. JAN 31 1961

ANNEX II, Item 4

Mercury Spacecraft Test Flight Completed

Cape Canaveral, Florida. - Preliminary data indicate that the Project Mercury spacecraft carrying a chimpanzee, launched at 11:55 a.m. EST here today, flew a ~~appeared to fly the preplanned~~ suborbital ballistic trajectory and landed approximately 420 miles downrange. Recovery ships are now being directed to the landing area.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

ANNEX IV

Rocket TV System to be Tested

Cape Canaveral, Fla.--A compact, all-transistorized TV camera, mounted externally near the top of a Redstone booster, is to relay to Cape Canaveral, Florida, pictures of MR-2 in flight.

It is believed to be the first time such a system has been flown on any rocket, although similar cameras have been used for years in airplane flight testing. In this first test, the camera is flying on a space available basis.

The 3-3/4 lb. unit, measuring about 12 inches long and 3 inches in diameter is to transmit 30 pictures a second to a remote ground station at the Cape where the pictures will be filmed. Such film will let project engineers observe the Redstone flight behavior and, most important, the motion of the spacecraft as it leaves the booster.

The wide-angle camera lens, set at F 1.5, will be pointed upward looking into a set of mirrors which will show rocket exhaust and the receding earth during boost phase. Within 2 seconds after posigrade rocket firing which separates spacecraft and booster, a steel housing supporting the mirrors is to move several inches away from the booster frame, giving the camera a good view of spacecraft separation movement. The steel housing will remain in place until after posigrade firing to protest the camera lens from blast and heat of the separation (posigrade) rockets.

The camera should observe the spacecraft for a few seconds as the spacecraft flies up and away from the booster. The camera should be out of booster-Cape transmission range before booster impact.

The camera's depth of field is from 2 feet to infinity and provides a 600-line resolution (Horizontal) picture. No change in focus or aperture is necessary. Total weight of the camera system, including housing and cabling is 45 lbs.

The camera system was designed by Lockheed Aircraft Corp., Sunnyvale, Calif., and was modified specially for this flight by the NASA Marshall Space Flight Center, Huntsville, Alabama. The system may be used in future tests to monitor critical operations in larger and more complex rockets.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

ANNEX V

MR-2 Flight Animal Subject

Cape Canaveral, Fla.-- The animal subject in today's flight is a 37-pound male chimpanzee born in the Cameroons, Africa, approximately 3-2/3 years ago. Selection of the 3-foot tall primate, identified as Animal Subject 65, was made approximately 24 hours before the scheduled launch by a team of biomedical specialists assigned to the Aeromedical Field Laboratory, Holloman Air Force Base, N.M., according to Maj. John D. Mosley, USAF officer in charge.

Physical and behavioral data were obtained on each of six chimpanzees in training at Cape Canaveral right up to the hour of selection. Performance of the flight animal was smooth and consistent indicating that he should prove more reliable and less affected by distractions than his five classmates.

The selection team revealed last night that in a final red-light lever-pulling test, the chimp selected scored 25.08 lever presses per 20-second interval or about 75 lever presses per minute. The chimpanzee must hit the lever at least once every 20 seconds to avoid a slight shock in the foot. A second psychomotor test required that the chimpanzee hit another lever to extinguish a blue light programmed to appear for a five second period each two minutes. The animal responded properly and rapidly recording a mean reaction time of eight-tenths seconds.

A second or backup chimpanzee has been prepared for flight in the event the primary animal cannot be used. The backup is a 47-3/4 lb. female known as Animal Subject 35. She is approximately four years old and also is from the Cameroons.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington 25, D.C.

TAPE OF THE PRESS CONFERENCE FOLLOWING THE LAUNCH OF MERCURY-REDSTONE NO. 2

- - -

Cape Canaveral, Florida

January 31, 1961

- - -

PRESENT:

ROBERT R. GILRUTH, Director, Space Task Group.

WALTER C. WILLIAMS, Associate Director, Space Task Group.

DR. KURT DEBUS, Director, NASA Launch Operations Directorate.

DR. J. P. KUETTNER, Chief, Mercury Project Office, Marshall Space Flight Center.

REAR ADMIRAL F. V. H. HILLES, Commander, Project Mercury Recovery Force.

MAJOR DAN MOSLEY, Aeromedical Laboratory, Holloman Air Force Base, New Mexico.

CAPTAIN L. GORDON COOPER, Astronaut.

- - -

PRESS CONFERENCE

MR. GILRUTH: Ladies and gentlemen: This test which has just been completed we would regard as a successful test.

Again I would like to comment upon the excellence of the team effort involving the launch team at the range here, the McDonnell Aircraft Corporation, the preparation team, NASA's own people here, and the task force under Admiral Hilles that is in the process now of tracing the capsule.

We feel that we in this test have gotten a lot of R and D information, very valuable information. We will not know all the details until we have a chance to see the record and until we see the capsule. We hope we will see the capsule. As last seen it was floating very well, holding its flotation. Admiral Hilles will talk about this in more detail.

This test has the first animal passenger in the production McDonnell capsule. Dr. Mosley, here on my left, will speak to this in a few minutes.

This test also had for the first time a closed loop automatic abort system aboard. As will be brought out here, because of a somewhat high performance of the Redstone booster and the closed loop abort system we got an unusually high capsule velocity which carried it farther down range than we had expected. This high velocity performance of the booster will be discussed by Dr. Debus.

This capsule also had aboard for the first time in a production capsule test the landing bag system which apparently, from the down range reports, worked successfully.

Walt Williams, who is the Operations Director for the Project Mercury, will also discuss the general operations and the general behavior of the capsule and the various teams involved in this test.

Now I would like to turn the microphone over to Dr. Debus.

DR. DEBUS: Thank you, Mr. Gilruth.

The countdown went to a point where some flaps that are supposed to cover the paint plugs of the Redstone upon lift-off were checked. At this time we discovered that a spring had loosened. This was at a very inaccessible place and therefore it took quite sometime to repair this. This was the reason for the hold, which you would probably like to know.

The second part of the count permitted us to jump several times and the flight performance was quite normal. Lift-off and flight was quite normal except for a high velocity, a high thrust. We are presently checking the telemeter records for the exact readings of this high thrust, and it may probably be found in a thrust regulator performance.

The high thrust led to a sensor and high velocity close to the projected cutoff time, and we had a higher lox consumption due to this thrust situation, which led, as was anticipated, to an abort due to thrust decay.

We had sensed a higher velocity and an earlier thrust decay and the abort functions started out at this time. The details of the abort function and the detail of the capsule performance will be discussed by Mr. Williams.

Thank you.

MR. WILLIAMS: As Dr. Debus described, the count did proceed normally, and in the second count we saved time. At the time the abort occurred, the sequencing of the capsule is such that the escape tower is fired and a retropackage is jettisoned. These two factors, plus the higher velocity of the Redstone, account for our extended range. In other words, we had additional velocity due to the tower, and then did not have the retrorockets to slow the capsule down. This did show, however, that our abort sequence worked quite well, and it was a good test of this facet of our capsule operation.

The flight from then on, from our standpoint, appeared normal until we lost the telemetry signal. Our impact predictions were good from our flight path. The details of this, of course, Admiral Hilles will fill in from his recovery forces.

The range operation was very good. We received the signals from all stations that we expected to receive.

We feel again we had a very good workout of our Mercury systems, which is one of the important parts of these tests, to build up a good experience level on all parts of the over-all Mercury system.

ANSWER: The recovery was in general normal to date. I just received a message which says that the destroyer R. A. Ellison is 18 miles from the capsule and will probably get there before the helicopters from the Donner. The preferred plan was to pick up the capsule by helicopters if it could accomplish this sooner. It appears that since the Ellison was closer to the place where the capsule actually landed, it will be the first one there. We estimate that this will probably be around 3:00 o'clock.

The ships involved in the exercise were eight in total, in a line from Cape Canaveral down to about 290 miles down range. The capsule actually landed about 96 miles from the predicted position. However, as soon as we had received early information that the shot would undoubtedly go over the predicted path, we started moving our forces in that direction, as a result of which the Ellison was some 20 miles or more toward the area than it had been when the shot was fired.

The first indication we had at 12:08, which was about 14 minutes after the lift-off, was a Sarah electronic indication from the capsule, presumably when it was still at 10,000 feet and when the main chute opened. This was picked up by two P2V's and one WV aircraft, both Navy, immediately, and they proceeded in this direction.

At 12:38, which was the final time, the first P2V No. 5 reported that it was over the capsule. P2V No. 5 is a Navy P2V Neptune and it was the first one to report the visual sighting and that the capsule was in good shape and that the weather looked good for recovery.

The pilot of this plane was Lieutenant A. W. Howard, of Ormond Beach, Florida. The technician who sighted it was G. T. Beldervack, of Durand, Wisconsin.

As far as we see, there should be no problem with the recovery. The preferred plan is, upon recovery, to deliver the primate after he of course has been inspected, upon retrieving aboard ship, with the veterinarian and the doctors from NASA who are present on the ships, and then to be taken to Grand Bahama Island.

VOICE: Dr. Mosley, would you like to talk about your protege?

MAJOR MOSLEY: We are quite happy with the success of this shot. I have only one or two comments because we have data to examine yet.

The animal performed as we expected all the way. We got good quality signals all the way to loss of signal.

I think I should limit my comments to that right now.

VOICE: I have not to add much to what Dr. Debus said. I anticipate that high velocity cutoff that we got this time will be corrected without difficulties, and we are quite glad that the booster abort system that was flown hot for the first time operated precisely as it was supposed to.

Thank you.

CAPTAIN COOPER: I don't have any comments to make. I think it would suffice to say that nothing succeeds like success. I am certainly very happy with the shot. I think we need to look at all the data to find out just how much real good data we did get. I think it will be extremely valuable to the program.

VOICE: Ladies and gentlemen, if you have questions now, if you will sound off I will try to relay them for you.

QUESTION: When do you think the chimpanzee may be brought back to land? Do you have a time estimate?

ADMIRAL HILLES: It looks like early tomorrow morning, shortly after daylight. We will not deliver it during darkness because the helicopter's flight can't be controlled the whole time. Therefore, we will probably deliver it early in the morning.

QUESTION: Do we know if the chimpanzee is alive?

ANSWER: I think I can answer that question. While we got telemetry it was performing as we expected, and that is all we know.

QUESTION: What kind of "G" force did the animal have? Do you have a number on that, Mr. Gilruth?

MR. GILRUTH: Preliminary numbers from the displays in the control central indicate that he got about a maximum of seven times gravity during the launch, and about 12 times gravity during the re-entry.

6

QUESTION: What is the chimpanzee's name?

ANSWER: It was animal subject No. 65.

QUESTION: What do we mean by performed as expected? Did he in fact move the lever and turn the light off?

MAJOR MOSLEY: As you may imagine, I was quite busy because I was monitoring with Dr. Stanley White, from NASA. I was monitoring the physiological data at one end of the room and the performance data at the other end of the room. I think all I can say is that when I was present to see the recorder myself, and when one other gentleman was watching it for me, we did not observe a shock, and the animal got the blue light two times to my personal knowledge, and got it just exactly right, well within the response rate.

QUESTION: What was our flight number, and what was our weightlessness time?

Mr. Williams or Mr. Gilruth, do you have any figures on that?

ANSWER: The normal mission would have been of the order of 15 minutes, and weightless period of the order of five minutes. This mission, since we did not receive telemetry to impact, we do not have exact figures. You could only guess that both of these would be somewhat larger.

QUESTION: What is the animal's pet name?

ANSWER: We flew animal subject No. 65.

QUESTION: Did the F-106 observe the capsule at any time after takeoff?

ANSWER: I don't think any of us know that right now.

VOICE: The only intent in this mission was to watch the boost phase, the takeoff phase.

QUESTION: Admiral, you are being asked for a time estimate of when the ship and/or the helicopter will reach the capsule?

ADMIRAL HILLES: It looks like about 3:00 o'clock, according to the latest information I have now. In other words, about 20 to 25 minutes from now it should be there, and it should be recovered a short time thereafter.

QUESTION: The other question that he is asking is a mechanical question. He wants to know if you are going to be informed of the status of the animal?

VOICE: Let me say that as soon as we know it, you will know it.

QUESTION: What was the weightlessness?

ANSWER: We have no way of knowing what the weightlessness was, right now.

VOICE: Not without working up the trajectory information.

QUESTION: What was the duration of our telemetry?

ANSWER: We received data from GBI. I don't recall the exact time offhand right now. I would say of the order of 12 to 14 minutes. At this time the capsule was down range of GBI. We lost signal, of course, when the capsule went below the horizon from the station at GBI.

QUESTION: How far is the capsule from the land mass?

ADMIRAL HILLES: It is 225 miles, very nearly on a direct line northeast from Grand Bahamas Island.

QUESTION: Dr. Kuettner or Dr. Debus, would either one of you like to expand your comments on the booster?

DR. DEBUS: I think we have to first check the details of the telemeter data before I could answer any questions.

QUESTION: Dr. Debus, the question here is can you repeat how the system works, as you described it in the begining?

DR. DEBUS: The thrust regulator system regulates the flow of the peroxide into the steam generator and turbine. It is actuated by a combustion chamber pressure sensor, and the system operated but it didn't operate fully. That means we flew with the throttle too far open and therefore at too high a velocity. This high velocity brought us to the intended point of the trajectory somewhat earlier than anticipated, and therefore the system, the abort-sensor system, which is based on thrust decay, in combination with the velocity cut-off system, led to the abort sensing system feeling the decay of the combustion chamber pressure and gave abort as it was supposed to be.

QUESTION: Will there be another chimp flight before a manned flight?

MR. GILRUTH: I would like to respond to that question by saying that it is very premature for us to discuss the next shot at this time while the capsule is still a long way away from us and until we have had a chance to study these data. So I would prefer that you would bear with me just to not press this point.

QUESTION: The question has to do with what time we heard certain communications equipment?

VOICE: I think one comment, Admiral, I would like to make, if I may, that everything we are talking about here are estimates. Whether it is 10,000 or not is an estimate. I think, therefore, that the time factors you will have to give us a break on. I don't think we can be hard with them.

Do you concur with that, Dr. Gilruth?

MR. GILRUTH: That is correct. The time 12:08 was the time that we first reported the electronic indications. They may not have been immediately at ten thousand feet. However, that was the planned level at which they were supposed to commence emitting the signal. Of course, the capsule still had 10,000 feet to fall before it came down. This was less than the flight time.

VOICE: Ladies and gentlemen, we are still in the middle of an operation. Could we break out here in about five minutes?

QUESTION: Do we know the temperature inside the capsule, and what was the outside temperature?

ANSWER: We didn't have direct reading of the outside temperatures in the control center. For one thing, measurements of this type on the Redstone are not of prime importance. There were temperatures measured concerning the passenger's comfort, and I believe this temperature stayed in the sixties.

Is that correct? Or 65?

ANSWER: The temperature that we desired was between 60 and 70, and please remember that I am giving you rough figures, too, because we have a lot of work to do this afternoon yet. The subject's temperature was "on the money" all the way. He had no problem as far as heat was concerned.

QUESTION: (Inaudible.)

ANSWER: All we had was an estimate, something of the order of 12 to 14 minutes after launch. Since we don't know specifically what that distance is, we can't tell you what the time is.

QUESTION: The question has to do whether you can give information on heartbeat rate and respiration rate.

Mr. Mosley?

MAJOR MOSLEY: I think I should say that we have got about 400 feet of records in there to look at. There are certain periods where I was able to make a sampling. But a sampling doesn't tell the whole story.

QUESTION: Would you say they were normal?

MAJOR MOSLEY: You want that part of the story? Let me say that the EKG signal, as far as wave form, was normal. I certainly would not like to be pinned down on rate shift. We know that they went up and we know that they went up within the expected range on this, because the subjects had experienced boost type loss before in the centrifuge. So we did not see anything that was unusual or that we did not expect.

QUESTION: The question is will Captain Cooper tell more of his personal reaction to the flight, and that of other Astronauts?

CAPTAIN COOPER: That is a pretty loaded question since there were no other Astronauts around. That lets me out on that part of it.

When it went by me it looked real good.

QUESTION: (Inaudible.)

ANSWER: Apogee we estimate at 155 statute miles.

QUESTION: The question is will the capsule be back here tomorrow morning?

ANSWER: I don't believe so. I believe it will be later on than the first thing in the morning. However, I will be able to tell a little bit better as soon as we recover it and get the distance figured out.

VOICE: These gentlemen have to get back and get this operation out of the way.

QUESTION: The question is, can we give any clues as to the phychological reaction of the animal?

Dan, did you talk to that animal?

MAJOR MOSLEY: No, I didn't have a word with it, except early this morning.

ANSWER: We just don't have data. We haven't analyzed it.

QUESTION: Do you have any basis now for making any comment on the psychological reaction of the animal?

ANSWER: I couldn't comment on his psychological reaction. I could comment on what he did. But I would hate to interpret exactly why he did it, or anything. As I said before, I was able to monitor this particular recorder at several different points during the flight, and he performed satisfactorily, and as we expected. He did not get a shock during those periods. Certainly I can't testify as to the rest of the time.

If you will remember the press kit on the blue light, to my knowledge -- because I saw it -- he got the blue light twice. We have to put faith in the telemetry signals. I started off by saying that we felt we had very good quality signals today.

QUESTION: The question is, on the basis of telemetry received, did the instrumentation work properly?

ANSWER: Are you talking about capsule instrumentation?

MAJOR MOSLEY: Yes, it did. We feel that we have good, solid information on all of the performances we measured during the flight of the systems. We have good trajectory data again, until loss of signal.

I might add, these data do extend well into re-entry, so we have that information as well.

QUESTION: The question is, since the animal hit the lever some 75 times, or whatever the figure is, does this label him or identify him as a nervous animal?

ANSWER: No, sir, this is a very stable animal.

QUESTION: The question for Dr. Debus or Dr. Kuettner: Did the launch vehicle television camera work?

DR. DEBUS: Yes, we have a signal for 530 seconds.

- - -